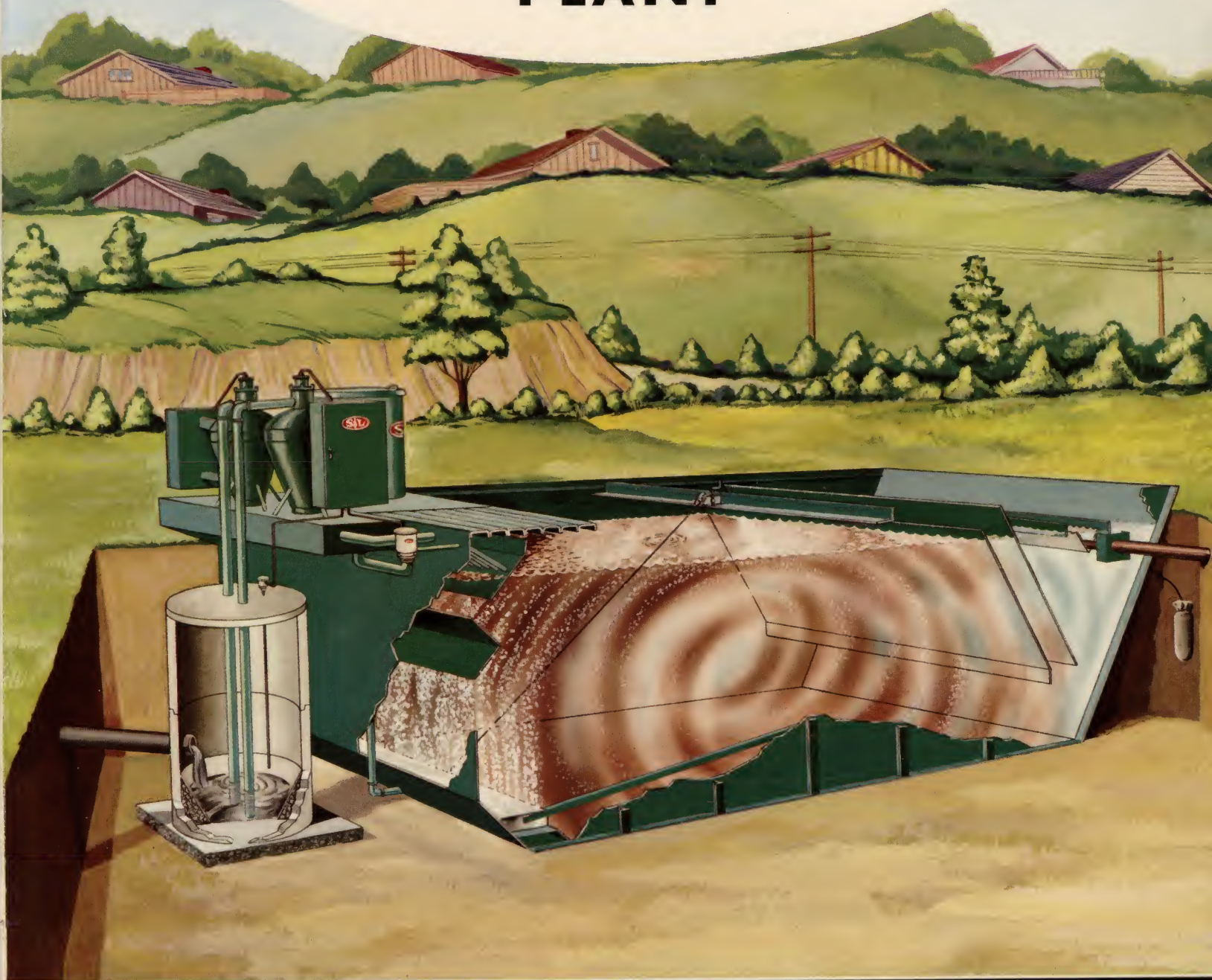


Smith & Loveless
"OXIGEST"
**FACTORY-BUILT
SEWAGE TREATMENT
PLANT**



MANUFACTURERS OF WATER AND SEWAGE TREATMENT EQUIPMENT



Smith & Loveless, Inc.

P. O. BOX 8884,
KANSAS CITY 15, MISSOURI

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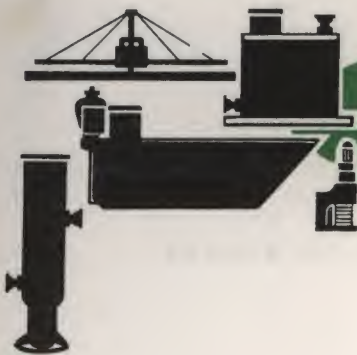
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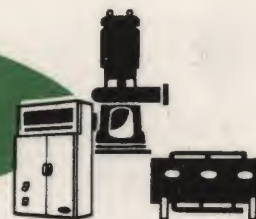


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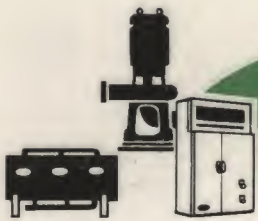
NOTES ON SMALL TREATMENT PLANTS FOR DOMESTIC SEWAGE

This brief outline is intended only to state the problem in simple terms, to summarize the principal characteristics of the most common methods of treating domestic sanitary sewage and to evaluate each method from the standpoint of the needs of a small plant.

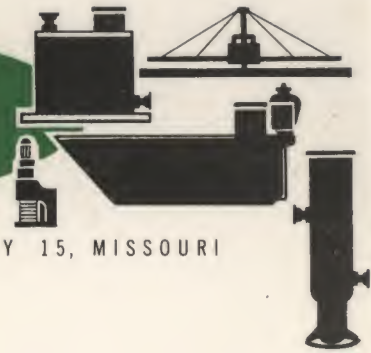
Design details are not given, both because design standards vary from state to state, and because the additional bulky detail would only confuse the non-technical reader.

For additional information we recommend a good text book such as "Sewage Treatment" by Karl Imhoff and Gordon M. Fair, published by John Wiley & Sons, Inc. Widely recognized design standards are given in the "Standards for Sewage Works" of the upper Mississippi River Board of Public Health Engineers and the Great Lakes Board of Public Health Engineers. These standards form the basis for the standards of the States of Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania and Wisconsin, who are members of the Joint Committee. Other states with similar climates also follow similar standards.





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NEED FOR SMALL PLANTS

Before World War II most sewer systems and sewage treatment plants in this country were paid for and operated by municipalities for the benefit of the residents of the city. Rising costs, plus greatly increased residential construction following the war, caused many cities to refuse to tax their old residents to supply water and sewer extensions for new sub-divisions, especially beyond the city limits.

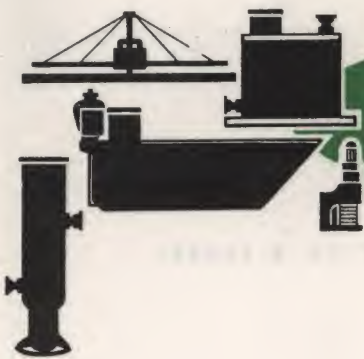
For some years, however, most cities have permitted the developer to construct the sewers and any lift stations required and then to turn them over to the city for operation and maintenance. Even sub-divisions beyond the city limits are commonly permitted to dump the sewage into the city system for disposal. The city retains veto powers over the design of such sewers and lift stations for their own protection. The cost of such improvements are added to the price of the real estate by the developer and passed on to the home buyer. The city plans on annexing the sub-division and taxing the property to cover the costs of municipal services. This is still the practice in a large part of our country.

Many new sub-divisions are now being located farther and farther from the city boundaries. Some are incorporating to prevent annexation by the city, thus protecting their low tax rates. Older municipalities find their sewers and their sewage treatment plants are becoming overloaded. They are no longer willing to receive the sewage from areas outside of their boundaries. Neither is it economically desirable in all cases to pump the sewage a long distance to an existing treatment plant. As a result, there has been a growing demand for well designed small sewage treatment plants for small to medium size sub-divisions as well as for isolated schools, institutions, factories, small cities, etc.

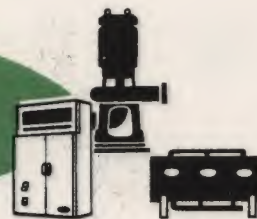
LIMITATIONS GOVERNING DESIGN

The design problems for such small plants include all of the problems encountered in most larger plants, such as determination of:

1. Water course or body of water into which treated effluent is to be discharged.
2. Location of Plant.
3. Degree of treatment required.



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4. Method of treatment.
5. Design details for plant construction.
6. Organization and training of operating staff.

In addition, some special problems arise.

1. It is not possible to obtain or afford a skilled full time operator for a very small plant. The design must be such to require only part time attention - say about 8 hours per week in all - by some one who is not a specialist in the control of biological treatment processes.
2. The plant must be installed before any houses are built and sold. It may take years to develop the full design loading. The plant must be designed to treat partial loading successfully.

It is desirable that the plant be designed, if possible, so that it can be built in stages, thus holding down the capital investment so that it more nearly parallels housing construction.

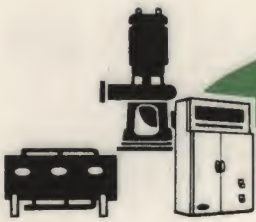
3. A consulting engineer must be retained to evaluate the problems, design the facilities, and secure the approval of the health authorities. Engineering costs may be excessive unless standardized designs can be utilized.

CHARACTERISTICS OF DOMESTIC SEWAGE

Most small plants serve a relatively small area close to the plant. The sewage arrives at the plant in relatively fresh condition. When fresh it has little odor, is gray in color, with solids only slightly disintegrated. Decomposition has not become evident and dissolved oxygen may still be present.

If the sewage is permitted to become stale and subsequently to become septic, its odor becomes pronounced, it turns black, the solids disintegrate and decompose, the dissolved oxygen is used up, and the formation of hydrogen sulfide commences.





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Average domestic sewage in the United States is 99.9 + % water. It contains about 0.55 lbs. of total solids per capita served per day. Each household with garbage grinder contributes about 0.17 lbs. additional per capita per day. It is unfortunate that so much water is used to transport so little undesirable matter.

Sewage contains both mineral and organic matter in suspension, in colloidal form, and in solution. Living organisms, principally bacteria and protozoa, live off the other organic matter and decompose it in the process. Uncontrolled decomposition of this type produces objectionable odors in sewers or in water courses to which the effluent is discharged. The same processes, however, under proper control in a sewage treatment plant are used for converting the organic material to a stable and inoffensive state.

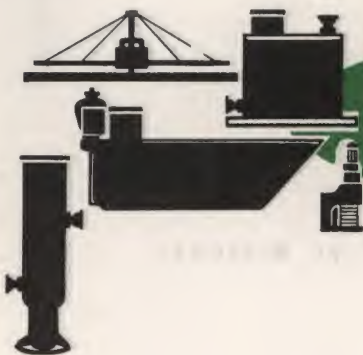
The problem is to remove the obvious solids which give the sewage effluent a bad appearance and to convert the remainder of the solids to a stable form, not subject to offensive decomposition and not a potential danger to health.

BIOCHEMICAL OXYGEN DEMAND (BOD)

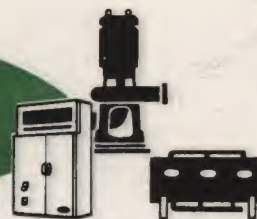
A standardized test procedure is used for determining the strength of sewage or the concentration of putrescible material in sewage. This laboratory test, generally referred to as the BOD test, measures the oxygen used by the sewage solids as they decompose. Hence the test indicates the potential nuisance value of the sewage.

DEGREE OF TREATMENT REQUIRED

All waste waters, including treated sewage, must ultimately enter the natural water courses or bodies of water. The degree of treatment required is determined by the local and/or state health officials having jurisdiction. Their engineers will establish the quality of the effluent which may be discharged into a particular water course or body of water selected for a given subdivision. Their engineers will also rule on the adequacy of the design submitted by the owner's consulting engineer.



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PRIMARY TREATMENT

Where a good size stream or lake is available to receive the effluent - one whose water has plenty of dissolved oxygen because it is not receiving much waste from nearby sources - the authorities may require only primary treatment of the sewage. Primary treatment removes a high percentage of the suspended solids but little or no colloidal or dissolved matter. The remaining solids are disposed of by dilution, and by oxidation or purification by the dissolved oxygen in the stream. Chlorination of the effluent may be required to kill bacteria in some cases.

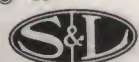
In primary treatment the suspended solids are normally removed by sedimentation and by skimming. This consists of passing the sewage through a tank or channel so large that the velocity of flow is reduced sufficiently to permit a high percentage of the heavier solids to settle to the bottom, and of the lighter-than-water solids to rise to the top. The mass of solids so removed is called "raw sludge". It is gray and has an objectionable odor. In it one can readily see fecal matter, paper, vegetable parings, etc. The sludge is sticky and does not give up its water readily. It can be air dried successfully only in thin layers. While air drying it gives off foul odors.

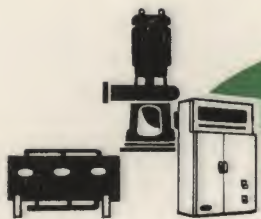
Primary sludge when removed from the primary sedimentation tank contains only 2 to 8 percent solids with an average of about 5 percent.

Properly designed sedimentation tanks will remove from 40 to 70 percent of the suspended solids. Also, from 25 to 40 percent of the Biochemical Oxygen Demand (BOD), and from 25 to 75 percent of the bacteria.

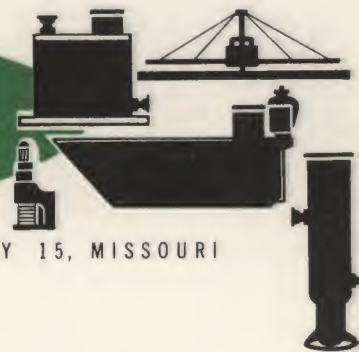
SLUDGE DIGESTION

The sludge must be disposed of. The common method is by anaerobic digestion in a specially designed closed tank, called a digester. Raw sludge contains abundant food for bacteria and other micro-organisms which are already present in the sewage. These living organisms break down complex organic matter into simple, more stable substances. In the absence of oxygen within the closed digester, only the anaerobic organisms survive and multiply. These organisms are able to live by drawing their oxygen from organic matter and from nitrates, sulfates, etc., instead of from dissolved oxygen in the water. Sludge digestion produces sludge gas which contains methane (marsh gas) carbon dioxide, nitrogen, oxygen, hydrogen, hydrogen sulfide and water vapor. It is odorous and is potentially explosive.





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Well digested primary sludge is black with a pleasant tar-like odor. It contains about 13 percent solids and has a bulk of less than 25 percent compared with the original raw sludge. In good weather it will dry rapidly on a sand bed without releasing offensive odors. The dried sludge is used for fertilizer or for land fill in low spots.

Unfortunately, the digested sludge produced by a small plant with an unskilled operator is not always well digested. Such sludge will not dry as readily and it will continue to digest on the sand bed giving rise to offensive odors.

Sludge drying beds require considerable land area. The average house holder does not like to have the settling basin, the digester, or the drying bed close to his home for aesthetic reasons, even if perfect operation eliminates odor problems. Hence, such plants must normally be located on a fairly large piece of land at some distance from the nearest home.

SEPTIC TANKS

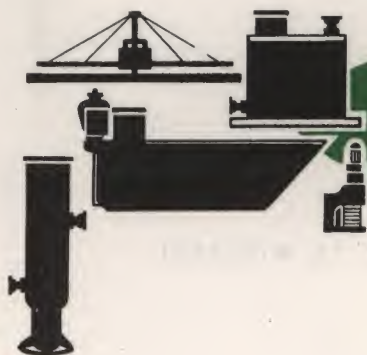
Septic tanks attempt to combine sedimentation with partial sludge digestion. Because the two functions are not properly separated, septic action continues to take place in the effluent causing odors and other nuisances. Septic tanks are rarely approved except for individual residences.

IMHOFF TANKS

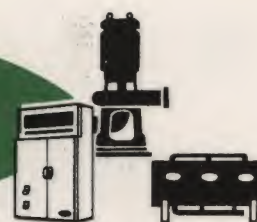
Imhoff Tanks are double compartment units which combine sedimentation above with separate sludge digestion below in one deep vertical structure. While Imhoff Tanks are a great improvement over septic tanks, they require more care in operation than they normally receive, and consequently create odor and nuisance problems.

SEPARATE SLUDGE DIGESTION

The best primary treatment plants have a screening device, a settling basin with mechanical sludge collector and skimmer, a separate heated sludge digestion tank with gas collection equipment, sludge recirculation pump, sludge withdrawal pump, and sludge drying beds or lagoon. Such plants require a skilled operator to give them regular attention.



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SECONDARY TREATMENT

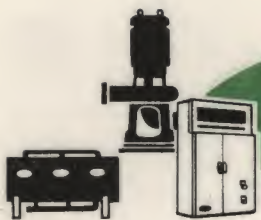
If the effluent must be discharged to a small lake with nearby bathing beaches or to a small stream or to a stream with a nearby waterworks intake or other special installations, the public health authorities will probably require secondary treatment.

Secondary treatment is commonly defined as the additional treatment of sewage by biological methods after primary treatment by sedimentation. Raw sewage contains high energy organic wastes which are a rich food source for living organisms such as bacteria, protozoa, etc. which are normally found in the sewage itself. The biological destruction of organic sewage material is fastest when plenty of free or dissolved oxygen is available to these microorganisms. At normal temperatures such decomposition will proceed almost three times as fast with plenty of oxygen present as in its absence. For this reason aerobic processes are commonly used for secondary treatment instead of anaerobic processes such as have previously been described under "SLUDGE DIGESTION". The greater speed of reaction of the aerobic processes reduces the size of the tanks and other structures required, and consequently the capital investment in the plant.

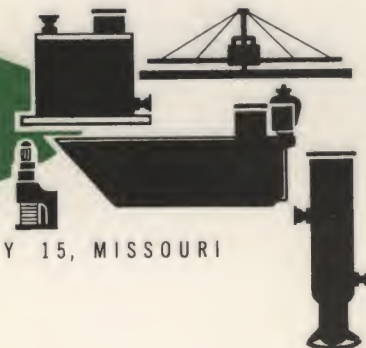
With plenty of oxygen and organic sewage solids present, the air-loving aerobic micro-organisms multiply rapidly. Sewage solids, coming in contact with the micro-organisms stick to them (adsorption) forming a floc. The bacteria then proceed to digest the solids at their leisure. This quick adsorption of the organic solids accounts for the fact that most of the removal is accomplished in the top few feet of a trickling filter or the first 20 to 40 minutes of the activated sludge process.

Aerobic treatment processes are designed to preserve an optimum quantity of the aerobic organisms and to bring the organic sewage solids into intimate contact with these organisms as quickly and efficiently as possible. Two principal aerobic treatment processes are in general use.





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TRICKLING FILTRATION

The trickling filter is not a filter or strainer at all. It is a bed of large rock or other material designed to provide a maximum of surface area on which aerobic micro-organisms can attach themselves. Large passages through the rock give access for plenty of air which is the source of the oxygen. The sewage is sprinkled on the rocks in a spray or thin film by a large rotating sprinkler known as a "Rotary Distributor". As it trickles down over the rock surfaces the aerobic bacteria adsorb the sewage solids and then digest them at their leisure. When the film of micro-organisms becomes too thick the ones underneath die for lack of oxygen and the mass sloughs off the rocks and is washed on through the filter by the sewage water.

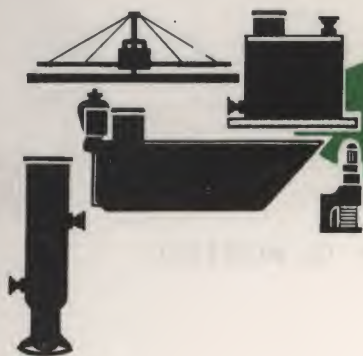
The liquor discharged from the bottom of the trickling filter is passed through a final settling tank where the floc containing dead and living micro-organisms is settled out along with any other settleable solids. The resulting sludge is pumped back to the primary sedimentation tank or to the sludge digester.

In some designs part of the effluent is recirculated to the primary tank or to the trickling filter to provide moisture and some food for the aerobic bacteria during periods of low flow of new raw sewage or to dilute strong sewage. High rate trickling filters are normally used with recirculation.

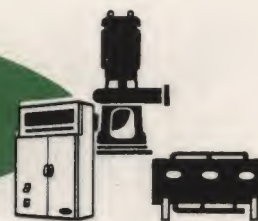
A good standard rate trickling filter plant will remove from 80 to 95 percent of the BOD, 70 to 92 percent of the suspended solids and 90 to 95 percent of the bacteria.

A good high rate trickling filter plant will remove from 65 to 95 percent of the BOD, 65 to 92 percent of the suspended solids, and 80 to 95 percent of the bacteria.

Such plants are relatively expensive to construct but take only moderate skill to operate. They are flexible and are not upset by fluctuations of incoming load.



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ACTIVATED SLUDGE PROCESS

The most widely used process in very large treatment plants is the activated sludge process. In this process the aerobic bacteria and other micro-organisms are mixed with the effluent from the primary sedimentation tank in an aeration tank. Air is bubbled through the mixture to stir it and to satisfy the oxygen demand. In the first 20 to 40 minutes the aerobic bacteria in the "activated sludge" adsorb most of the sewage solids. Aeration is continued for a total of about $7\frac{1}{2}$ hours to permit the bacteria to digest the solids. The mixture then flows to a final settling tank where the floc of micro-organisms and residual solids settle out. A clear, sparkling effluent is discharged to the stream. Sufficient floc, now called "activated sludge", is returned to the aeration tank to keep the process going. The balance of the activated sludge goes to the digester.

There are a number of modifications of the process, aimed at reducing tank volumes or air consumption, or at making the process easier to control.

Good efficiency of the process requires skillful and experienced operators with laboratory equipment to analyze the sewage in process. Where this requirement can be met the activated sludge process is currently considered the best process for large scale sewage treatment. It can be expected to remove 75 to 95 percent of the biochemical oxygen demand, 85 to 95 percent of the suspended solids, and 90 to 98 percent of the bacteria.

SUPER AERATION

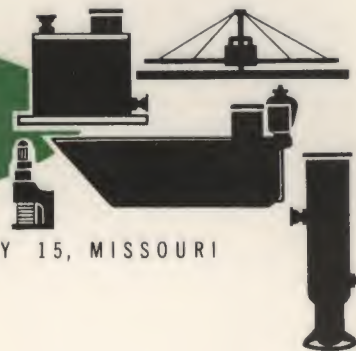
"Super Aeration" is a relatively new term which has come into use to describe a simple dependable treatment process which is used primarily in small plants to produce results superior to primary treatment with an investment considerably below that for a standard complete biological treatment process.

It has long been known to experts in the field that sewage can be oxidized to a flaky ash of very little bulk by bubbling sufficient air through it for a sufficiently long period of time. This process has been called "Super Aeration" because of the greatly increased amount of air used in comparison with "activated sludge process". It has also been called "Wet Combustion" because of the oxidation of the organic matter which takes place in the fluid without appreciable rise in temperature, and it has been called "Total Oxidation".





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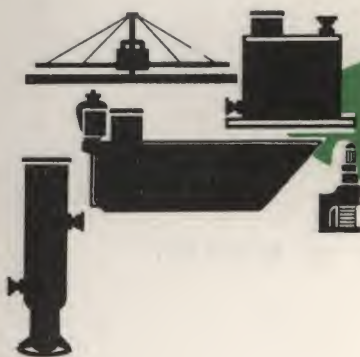
The first cost, or capital investment, for such a plant is low because the plant is very simple. No primary settling tank is required. The sewage passes through a bar screen to remove very large solids and debris. It then flows directly into the aeration tank which is the heart of the system.

The aeration tank is usually rectangular with means to bubble air in near the bottom at one end through a suitable diffuser which breaks up the air into small bubbles. The air is usually forced in by a rotary or centrifugal air compressor.

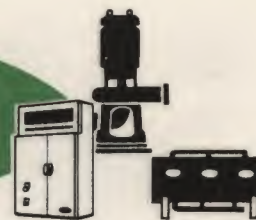
The total design air requirement is divided between two compressors. Only one need be operated during periods of low demand, such as when only a few houses have been connected in a new subdivision. Because of the high design air capacity, one compressor alone will give pretty good treatment if the other should fail in service, and require repairs.

In the aeration tank a variety of treatment activities take place at the same time and in the same tank. The turbulence produced by the excess air tends to break up the sewage solids. It also causes the contents of the tank to be turned over and over bringing the contents in contact with the outside air surface where additional oxygen may be picked up. Aerobic bacteria and other living organisms present in the sewage are stimulated to activity by the abundant oxygen and proceed to digest the organic sewage solids present both in suspension and in solution. The well fed aerobic bacteria and protozoa, etc. divide and multiply their numbers. Some of the organic matter is oxidized - that is, burned at low temperature, directly to an ash. The excess aerobic bacteria and micro-organisms are oxidized in turn to an ash. The percentage of results achieved by each type of activity will depend upon the loading of sewage in relation to the oxygen supply at a particular moment.

After aeration the sewage flows to a settling basin. The solids are returned from the bottom of the settling basin to the aeration tank for further treatment and to seed the incoming sewage with living organisms. The effluent flows over a weir to the receiving stream. The final settling basin is generally part of the same structure as the aeration tank with only separating baffles in between.



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In some states a sludge storage tank may be required to receive excess sludge if any forms. Other states have convinced themselves that a sludge storage tank is not required where normal conditions exist.

Plants of this type are now available as complete factory-built units, such as the Smith & Loveless "Oxigest", each of which is suitable by itself for a small subdivision, institution, etc. For larger loadings two or more such factory-built units can be run in parallel. The multiple units need not be side-by-side but may be located so as to minimize pumping. The units can be purchased separately to match the growth of demand as additional houses are built.

Super aeration plants produce an effluent which is stable and is aesthetically acceptable even with little or no dilution by the receiving stream. Because of the excess air no anaerobic digestion can take place. Hence, no odors can be produced.

Being odor free such plants can be located close to homes or other buildings. It is only necessary to fence them or cover them to keep children from coming in contact with the untreated sewage or the machinery. The best designed plants cover the several basins so that the contents are out of sight and hence, out of mind.

While super aeration plants use more electric power than other biological treatment processes, the savings in capital costs and payroll costs will more than balance the increased power costs in a small plant.

A well designed secondary treatment plant of this type will remove 75 to 90 percent of the BOD. The suspended solids in the effluent will be stable and very finely divided.

INTERMITTENT SAND FILTRATION

Where natural sand beds are available a high degree of secondary treatment can be obtained at a reasonable cost by intermittent sand filtration of the effluent from the primary tank. Properly designed and maintained sand filters will remove 90 to 95 percent of the BOD, 85 to 95 percent of the suspended solids, and 95 to 98 percent of the bacteria.

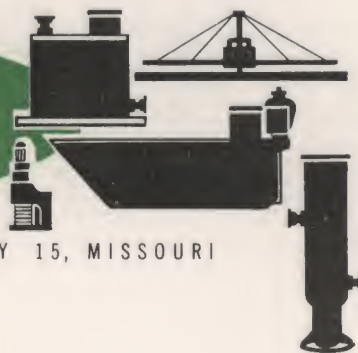
Some odor nuisance is inevitable from such sand filters as the sludge film contains raw sludge which will continue to break down by anaerobic digestion.



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Filtration through sand is sometimes used to polish the effluent from a "Super Aeration" Plant where the effluent is discharged to a water course which is normally dry. Because of the stable nature of "Super Aeration" effluent, no odor nuisance should result from such an application.

COMPLETE TREATMENT

Complete treatment means the removal of a high percentage of suspended, colloidal and dissolved organic matter. Usually the term refers to primary, plus secondary treatment as described above.

SEWAGE LAGOONS

Since World War II considerable research has been done on sewage treatment in lagoons, sometimes called "Stabilization Ponds". Raw sewage flowing into the lagoon receives complete treatment by sedimentation and by biological stabilization of organic wastes. The biological part of the treatment is similar to that in the trickling filter or activated sludge process. Aerobic bacteria take oxygen and sewage solids from the water. The oxygen required is obtained from algae growing in the water and from surface contact with the atmosphere. The energy, or power, is supplied by the sun through photosynthesis.

Well designed lagoons are free from odor nuisance. The effluent from the lagoon is low in objectionable material or BOD from the sewage but may be objectionable for some methods of disposal because of excessive amount of algae.

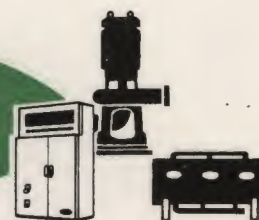
Neighbors have found the lagoons objectionable for aesthetic reasons and have taken court action in some areas to prevent their construction.

CHLORINATION

Chlorine may be added to sewage either to oxidize part of the organic material in the sewage (thus reducing the BOD) or to reduce the number of bacteria in the sewage making it less likely to contain disease organisms. Also, it will delay the decomposition of the organic material and so reduce the possibility of odor nuisances. It is more economical to reduce the BOD of sewage by one of the treatment processes previously described than to use chlorine for this purpose.



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The most common use of chlorine in sewage treatment is to kill all or most of the bacteria remaining in sewage after it has passed through a complete sewage treatment system. Chlorination of treatment plant effluents may be required by state regulatory agencies where it enters a body of water used for recreational purposes or where it is discharged near the intake of water-supply systems. It may be useful as an emergency measure when the normal, complete sewage treatment process breaks down for any reason but it seldom can be justified as a regular part of a complete sewage treatment process producing a stable effluent even when the outlet water courses normally provide no dilution.

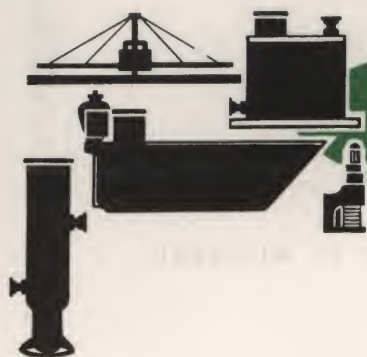
Chlorine may be purchased either as a hypochlorite in the form of a white powdery material or as a gas, generally supplied in a compressed, liquid state in steel cylinders. The hypochlorite (powder) form is used by making a water solution and pumping it into the sewage plant effluent with a special metering pump. This solution is very corrosive to metal. The use of chlorine gas also requires a special machine or chlorinator which is relatively expensive. (Then, too, chlorine gas is poisonous and must be handled with extreme care).

For chlorination to be effective, the chlorine application rate should be accurately adjusted to the demand by means of frequent residual chlorine tests. Generally, a chlorine contact tank that provides a minimum retention of 20 to 30 minutes is required and the chlorine feeding equipment must be housed for protection from freezing and other damage. When the cost of the chlorinating machine, the chlorinator housing and the chlorine contact tank are added to the cost of the chlorine and the wages of the operator who must give daily attention to the system, it is obvious that chlorination is relatively expensive for small sewage treatment installations and should be used only where the water use immediately downstream from the sewage treatment plant justifies the extra expense.

OTHER PROCESSES

There are a number of other processes used to some extent in the treating of municipal sewage. Most of them are combinations of those previously described, coupled for highly technical reasons, in an effort to obtain a better effluent or to meet special local requirements. It is not necessary, however, to understand such details to have a good general grasp of current sewage treatment processes used in the United States, especially those used in the treatment of domestic sewage in small plants.





Smith & Loveless. Engineering DATA



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Page 19

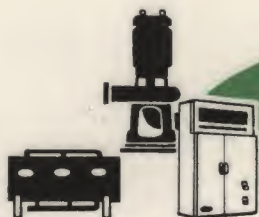
May 15, 1958

REV. 1-59

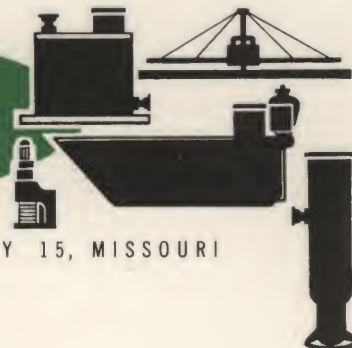
SEWAGE VOLUME AND BOD FOR VARIOUS SERVICES *

Type	Gallons per person per day	Pounds 5 day BOD per person per day
Airports:		
Each Employee	10	0.06
Each Passenger	3-5	0.02
Bars:		
Each Employee	10	0.06
Plus each Customer	2	0.01
Camps & Resorts:		
Luxury Resorts	100	0.17
Summer Camps	50	0.15
Construction Camps	50	0.15
Domestic Sewage: **		
Luxury Homes	100	0.20
Better Sub-divisions	90	0.20
Average Sub-divisions	80	0.17
Low Cost Housing	70	0.17
Summer Cottages, etc.	50	0.17
Apartment Houses	75	0.17
Factories: (Exclusive of Industrial and Cafeteria Wastes)	15	0.06
Hospitals:		
Patients, plus staff	150-300 (Average 200)	0.20





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SEWAGE VOLUME AND BOD FOR VARIOUS SERVICES *

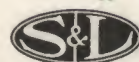
Type	Gallons per person per day	Pounds 5 day BOD per person per day
Hotels, Motels, Trailer Courts, Boarding Houses: (Not including Restaurant or Bar)	50	0.15
Milk Plant Wastes: ***	100-225 gallons per 1000 lbs. of milk	0.56 to 1.66 per 1000 lbs. of milk
Offices:	15	0.06
Restaurants:		
Each Employee	10	0.06
Plus each meal served	3	0.025
Schools:		
Day Schools:		
Each person, student or staff	10	0.06
Add per person if showers provided	5	-
Add per person if cafeteria provided	5	-
Add per person if cafeteria has garbage grinder	-	0.02
Boarding Schools:	75	0.17
Swimming Pools:		
Employees, plus Customers	10	0.06
Theatres:		
Drive in Theatre per stall	5	0.03
Movie Theatre per seat	5	0.03

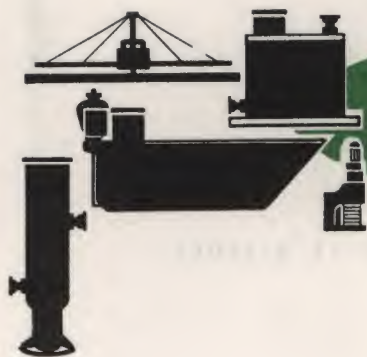
* Our suggestions for average load. Local health authorities may have different standards.

** The average house has 3.6 people living in it.

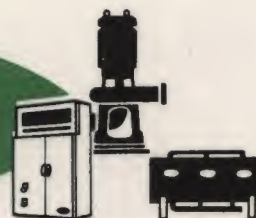
*** For other industrial applications refer to the factory.

MANUFACTURERS • LIFT STATIONS • WATER AND SEWAGE TREATMENT EQUIPMENT





Smith & Loveless. **Engineering DATA**



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SIZING OF "OXIGEST" FACTORY-BUILT TREATMENT PLANT

The Smith & Loveless "Oxigest" is a factory-built unit for "Super Aeration Treatment" as described on pages 9, 10 and 11 of the preceding Data Section Notes. It is constructed as described in the sample "Specifications for "OXIGEST" Sewage Disposal Plant" in the back of this folder. It is illustrated in the following pages.

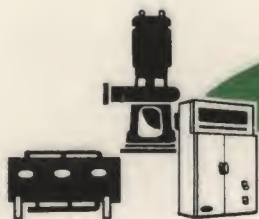
Each "Oxigest" Plant is completely factory assembled and tested mechanically and electrically. It can be installed and placed in service in one day after delivery. Delivery is normally direct to the job site on Smith & Loveless special lowboy trucks.

A set of "Installation Instructions" to answer questions about unloading, excavation, foundation, etc. will be found at the end of this booklet.

SELECTION

1. First calculate the volume of sewage in gallons entering the plant every 24 hours by use of standards obtained from the Board of Health, or from our recommended design standards on pages 19 and 20 of the Data Section just preceding this page.
2. Next calculate the total daily 5-day BOD load using the same design standard.
3. The size of the "Oxigest" structure is determined by the size of the aeration tank. Because the aeration tank is normally designed for 24 hours detention of the design flow, it follows that the size of the aeration tank in gallons is numerically equal to the design flow in gallons per day. This is the total from Item 1 above.

It is important to remember, however, that an aeration period of more than 24 hours may be required if extremely strong sewage is to be treated. Check this by multiplying the pounds of 5-day BOD per day by 250 gallons. If the result is larger than the 24-hour flow in gallons, the aeration tank capacity must be increased to this figure. Consult the factory for recommendations whenever there is any doubt regarding the aeration tank capacity required. Always consult the factory when treatment of industrial wastes is proposed.



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Select the "Oxigest" Unit from pages D-2 or D-3 which will have the correct aeration tank capacity or slightly more capacity (Column 2). If one standard "Oxigest" Unit will not accommodate this much, divide the gallonage among two or more units to be operated in parallel.

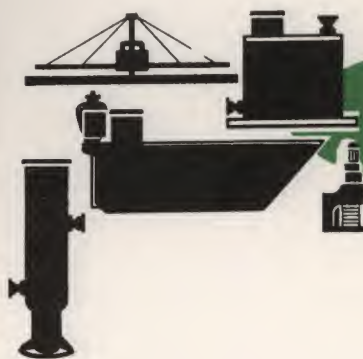
4. The size of the air blowers is determined by the amount of 5-day BOD loading per 24 hours as calculated from Item 2 above. We recommend the installation of a total blower capacity equal to or exceeding 3000 cu. ft. of air per pound of 5-day BOD, but in no case should the capacity of any blower be less than 3 cu. ft. per minute (3 CFM) multiplied by the inside tank width. Preferably, the total design air capacity should be divided between two or more blowers of equal size. This insures that reasonably good sewage treatment will be obtained even though one blower should fail. Two blowers, of course, cost more than a single blower of equal capacity so, for economy reasons, use of a single blower on very small installations sometimes is accepted. We recommend when a single blower is specified and funds are insufficient to permit a duplex installation that the capacity of the single blower be equal to 3000 cu. ft. of air per pound of 5-day BOD but some state authorities have approved single blower installations of capacity equal to only 2100 cu. ft. of air per pound of 5-day BOD for minimum cost projects.

After computing the pounds of 5-day BOD per day, blowers may be selected accurately from the characteristic performance curves or tables of the blower manufacturer. The table below indicates the general range of performance characteristics for blowers of the types generally used.

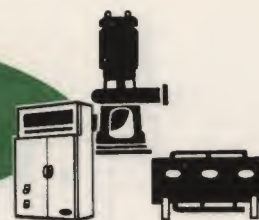
Motor Horsepower	Maximum Blower Speed RPM	Maximum Blower Capacity CFM *	Maximum 5-day BOD Capacity of Single Blower Pounds **
1	1770	39	18
1½	960	48	23
2	1280	78	37
3	1130	125	60
5	885	220	105

* Based on 3½ pounds per sq. inch pressure.

** Based on 3000 cu. ft. of air per pound of 5-day BOD.



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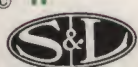
Page 23

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ESTIMATING PRICE

Individual "Oxigest" Units of the sizes shown in the tables on pages D-2 and D-3 will range in price from about \$7,500.00 to \$19,000.00, including truck delivery to the job site or rail delivery to the nearest rail siding. These are estimating prices to the contractor and do not include the contractor's installation cost, overhead and profit.

Refer to your Smith & Loveless Sales Representative or to the factory for more exact information on selecting "Oxigest" size, selection of blowers, use of accessory equipment and prices.



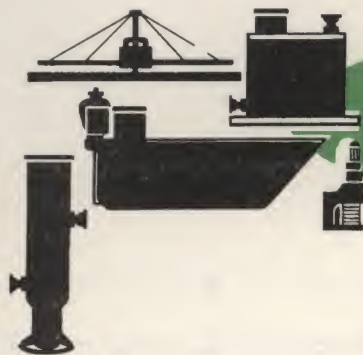


THE
COLUMBIAN
1892

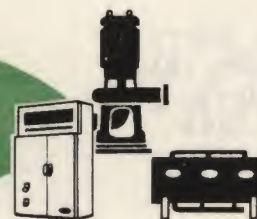
THE COLUMBIAN

The Columbian is a weekly publication, published every week, except on Sundays and public holidays. It is a paper of general interest, containing news, literature, and other matters of the day. It is published by the Columbian Press, Limited, of the City of London. The price of the paper is one penny per copy, and it is sold by all news-vendors and booksellers. The paper is also sold by subscription, and the price of a year's subscription is one guinea. The paper is published in the City of London, and its office is at No. 1, Abchurch Lane. The paper is published by the Columbian Press, Limited, of the City of London.

No.	Name	Address	
		Street	City
1	John Smith	10, Broad Street	London
2	James Brown	20, Broad Street	London
3	Robert White	30, Broad Street	London
4	Thomas Green	40, Broad Street	London
5	William Black	50, Broad Street	London



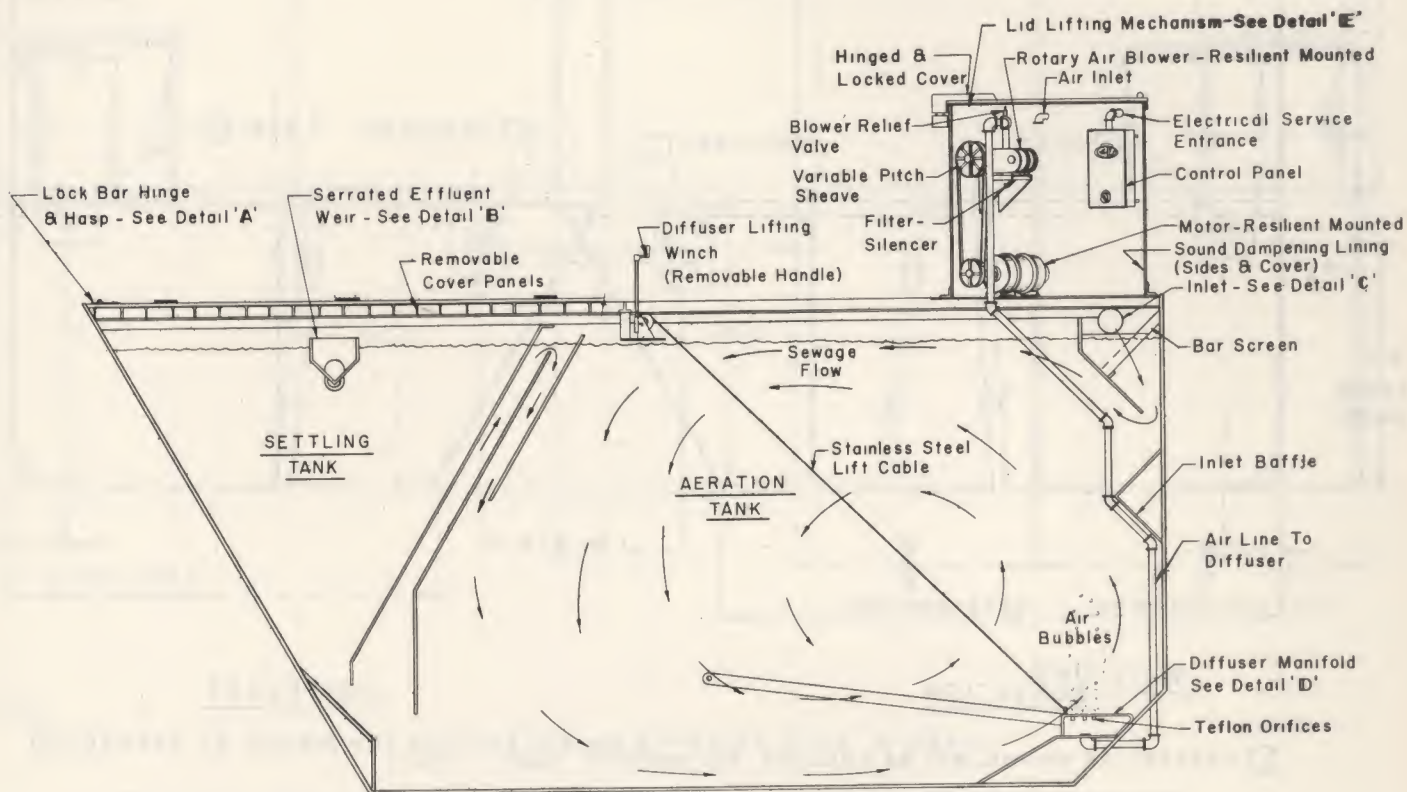
Smith & Loveless, Engineering DATA



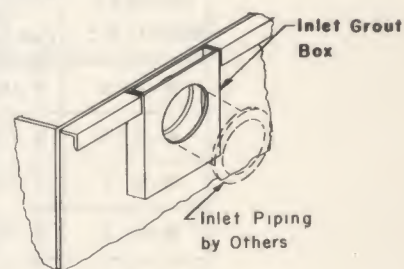
P. O. BOX 8884 KANSAS CITY 15, MISSOURI
"OXIGEST"

Sewage Treatment Plant
Features Of Construction

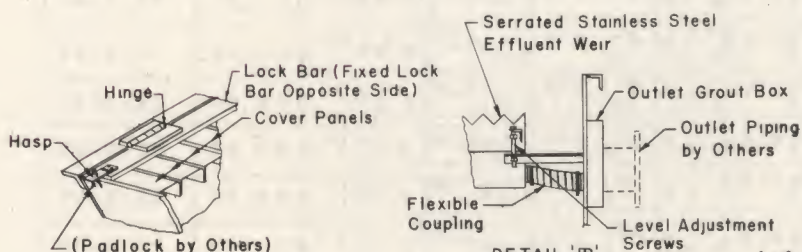
SECTION 1210
PAGE D-1
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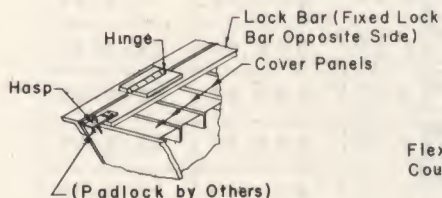
Typical Cross Section
"OXIGEST" Sewage Treatment Plant



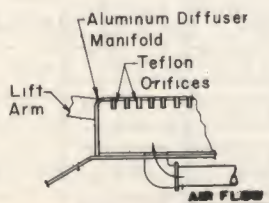
DETAIL 'C'



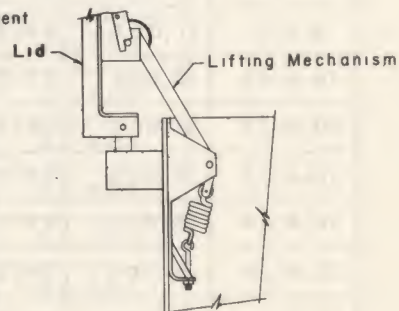
DETAIL 'B'



DETAIL 'A'



DETAIL 'D'

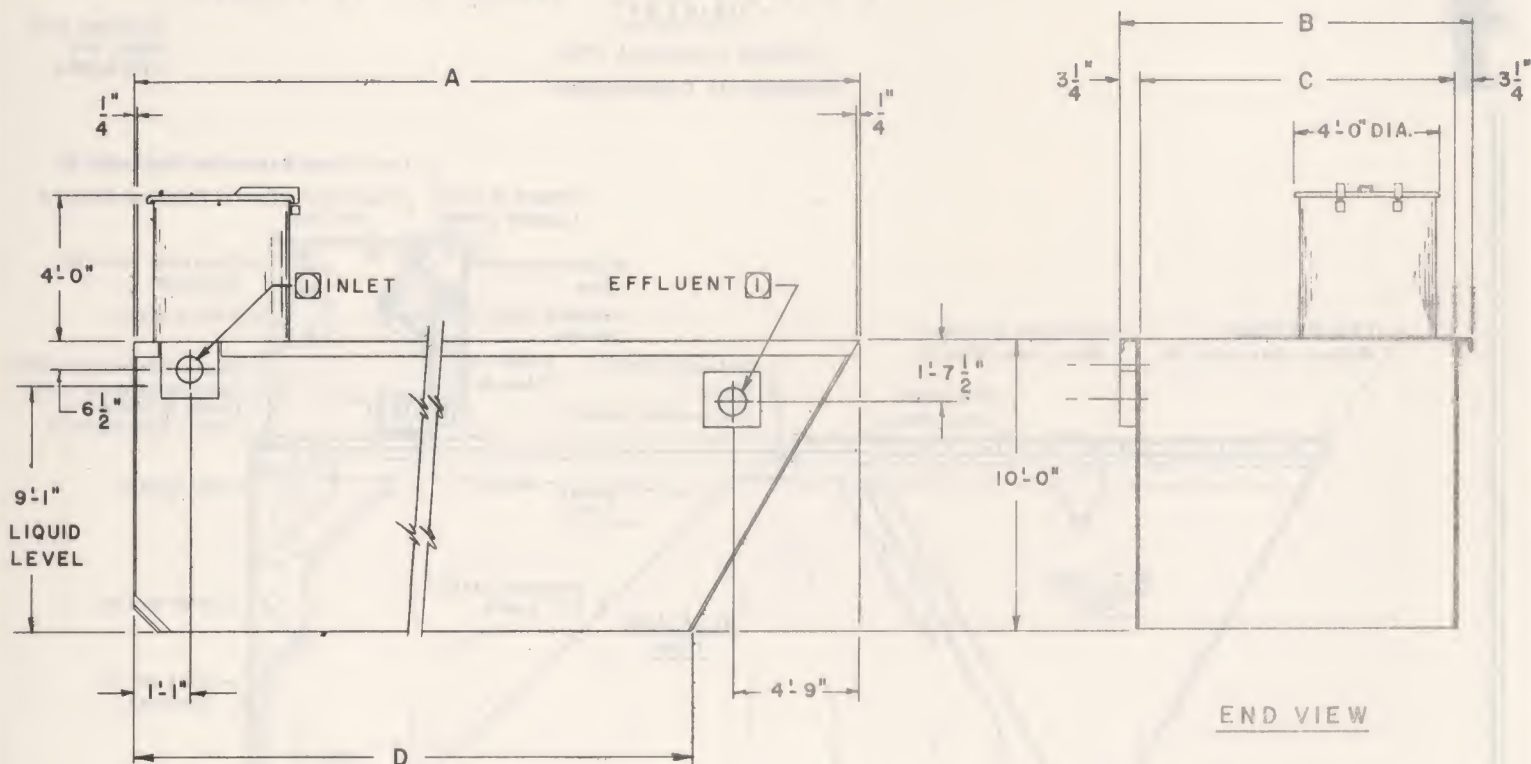


DETAIL 'E'



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Layout Dimensions
"OXIGEST"
Sewage Treatment Plant



ELEVATION

NOTE:

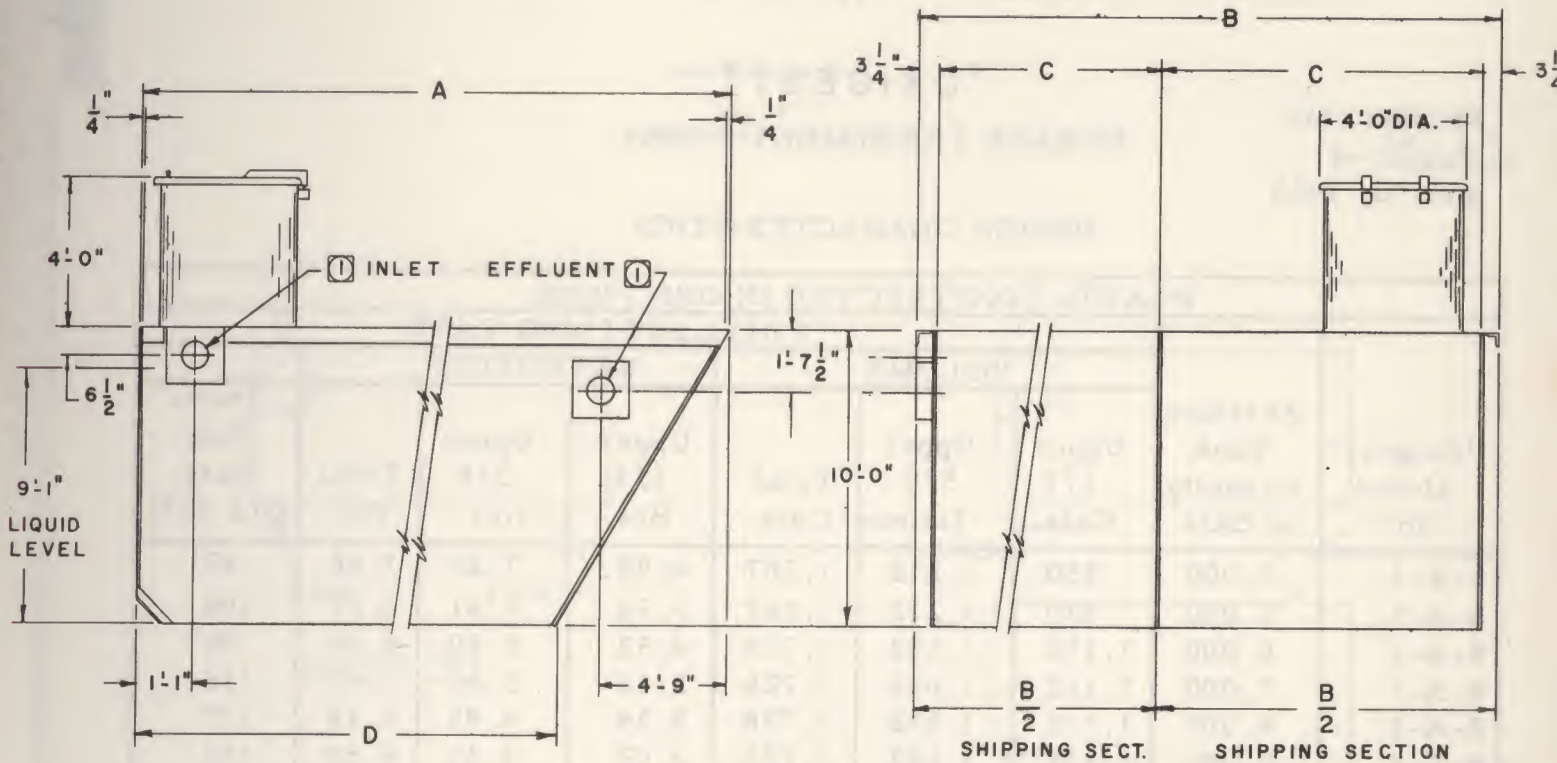
① LOCATED AS SHOWN, MAY BE LOCATED ON OPPOSITE SIDE IF REQ'D.

OXIGEST MODEL N ^o .	AERATION TANK CAP. IN GAL.	DIMENSIONS				APPROX. SHIPPING WEIGHTS
		A	B	C	D	
6-A-4	4,000	18'-3 3/4"	6'-0"	5'-5 1/2"	12'-6"	10,700
6-A-5	5,000	20'-11 3/4"	6'-0"	5'-5 1/2"	15'-2"	11,800
8-A-6	6,000	19'-4 3/4"	8'-0"	7'-5 1/2"	13'-7"	14,200
8-A-7	7,000	21'-9 3/4"	8'-0"	7'-5 1/2"	16'-0"	15,100
8-A-8	8,000	23'-7 3/4"	8'-0"	7'-5 1/2"	17'-10"	15,800
8-A-9	9,000	25'-3 3/4"	8'-0"	7'-5 1/2"	19'-6"	16,400
8-A-10	10,000	27'-3 3/4"	8'-0"	7'-5 1/2"	21'-6"	17,200
8-A-11	11,000	29'-3 3/4"	8'-0"	7'-5 1/2"	23'-6"	17,600
10-A-12	12,000	26'-2 3/4"	10'-0"	9'-5 1/2"	20'-5"	17,900
10-A-13	13,000	28'-3 3/4"	10'-0"	9'-5 1/2"	22'-6"	18,700
10-A-14	14,000	29'-3 3/4"	10'-0"	9'-5 1/2"	23'-6"	19,100
12-A-15	15,000	27'-3 3/4"	12'-0"	11'-5 1/2"	21'-6"	19,800
12-A-16	16,000	28'-3 3/4"	12'-0"	11'-5 1/2"	22'-6"	20,200
12-A-17	16,950	29'-3 3/4"	12'-0"	11'-5 1/2"	23'-6"	20,700

ALL DIMENSIONS FOR REFERENCE ONLY AND NOT TO BE USED FOR CONSTRUCTION.

Layout Dimensions
"OXIGEST"
Sewage Treatment Plant
(2 Piece Construction For Field Assembly)

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NOTE:

ELEVATION

END VIEW

① LOCATED AS SHOWN, MAY BE LOCATED ON OPPOSITE SIDE IF REQ'D.

OXIGEST MODEL NO.	AERATION TANK CAP. IN GAL.	DIMENSIONS				TOTAL APPROX. SHIPPING WEIGHTS
		A	B	C	D	
16-B-15	15,000	21'-9 ³ / ₄ "	16'-0"	7'-8 ³ / ₄ "	16'-0"	21,800
16-B-17	17,000	23'-7 ³ / ₄ "	16'-0"	7'-8 ³ / ₄ "	17'-10"	22,800
16-B-19	19,000	26'-2 ³ / ₄ "	16'-0"	7'-8 ³ / ₄ "	20'-5"	24,300
16-B-21	21,000	28'-3 ³ / ₄ "	16'-0"	7'-8 ³ / ₄ "	22'-6"	25,500
16-B-23	22,900	29'-3 ³ / ₄ "	16'-0"	7'-8 ³ / ₄ "	23'-6"	26,000
20-B-23	23,000	25'-3 ³ / ₄ "	20'-0"	9'-8 ³ / ₄ "	19'-6"	27,500
20-B-25	25,000	27'-3 ³ / ₄ "	20'-0"	9'-8 ³ / ₄ "	21'-6"	28,600
20-B-27	27,000	28'-3 ³ / ₄ "	20'-0"	9'-8 ³ / ₄ "	22'-6"	29,100
20-B-29	28,800	29'-3 ³ / ₄ "	20'-0"	9'-8 ³ / ₄ "	23'-6"	29,700
24-B-29	29,000	26'-2 ³ / ₄ "	24'-0"	11'-8 ³ / ₄ "	20'-5"	31,800
24-B-31	31,000	27'-3 ³ / ₄ "	24'-0"	11'-8 ³ / ₄ "	21'-6"	32,400
24-B-33	33,000	28'-3 ³ / ₄ "	24'-0"	11'-8 ³ / ₄ "	22'-6"	32,900
24-B-35	34,700	29'-3 ³ / ₄ "	24'-0"	11'-8 ³ / ₄ "	23'-6"	33,500

ALL DIMENSIONS FOR REFERENCE ONLY AND NOT TO BE USED FOR CONSTRUCTION.

"OXIGEST"

Section 1210

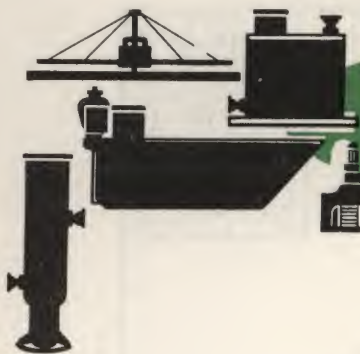
Page D-4

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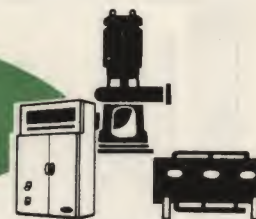
SEWAGE TREATMENT PLANT

DESIGN CHARACTERISTICS

PLANTS CONSTRUCTED IN ONE PIECE								
"Oxigest" Model No.	Aeration Tank Capacity in Gals.	FINAL SETTLING TANK						
		VOLUME			RETENTION			Over- flow Rate G/F 2/D
		Upper 1/3 Gals.	Upper 5/8 Gals.	Total Gals.	Upper 1/3 Hrs.	Upper 5/8 Hrs.	Total Hrs.	
6-A-4	4,000	830	1,212	1,267	4.98	7.26	7.60	87
6-A-5	5,000	830	1,212	1,267	3.98	5.81	6.07	109
8-A-6	6,000	1,132	1,652	1,728	4.52	6.60	6.90	96
8-A-7	7,000	1,132	1,652	1,728	3.88	5.66	5.92	111
8-A-8	8,000	1,132	1,652	1,728	3.39	4.95	5.18	127
8-A-9	9,000	1,132	1,652	1,728	3.02	4.41	4.60	143
8-A-10	10,000	1,132	1,652	1,728	2.72	3.97	4.15	159
8-A-11	11,000	1,132	1,652	1,728	2.47	3.61	3.77	174
10-A-12	12,000	1,439	2,098	2,192	2.87	4.19	4.38	150
10-A-13	13,000	1,439	2,098	2,192	2.65	3.88	4.05	163
10-A-14	14,000	1,439	2,098	2,192	2.46	3.60	3.76	175
12-A-15	15,000	1,740	2,540	2,655	2.78	4.06	4.25	155
12-A-16	16,000	1,740	2,540	2,655	2.61	3.81	3.98	166
12-A-17	16,950	1,740	2,540	2,655	2.46	3.60	3.76	175
PLANTS CONSTRUCTED IN TWO PIECES								
16-B-15	15,000	2,350	3,430	3,580	3.76	5.48	5.73	115
16-B-17	17,000	2,350	3,430	3,580	3.32	4.84	5.05	130
16-B-19	19,000	2,350	3,430	3,580	2.97	4.33	4.52	146
16-B-21	21,000	2,350	3,430	3,580	2.69	3.92	4.08	161
16-B-23	22,900	2,350	3,430	3,580	2.46	3.59	3.75	175
20-B-23	23,000	2,960	4,320	4,510	3.08	4.50	4.70	140
20-B-25	25,000	2,960	4,320	4,510	2.84	4.14	4.33	152
20-B-27	27,000	2,960	4,320	4,510	2.63	3.83	4.00	164
20-B-29	28,800	2,960	4,320	4,510	2.46	3.60	3.75	175
24-B-29	29,000	3,565	5,210	5,440	2.95	4.31	4.50	147
24-B-31	31,000	3,565	5,210	5,440	2.76	4.03	4.21	157
24-B-33	33,000	3,565	5,210	5,440	2.59	3.79	3.96	167
24-B-35	34,700	3,565	5,210	5,440	2.46	3.60	3.76	175



Smith & Loveless, **Engineering DATA**

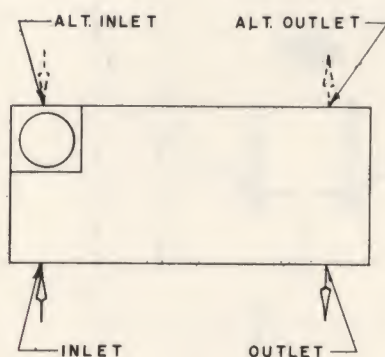


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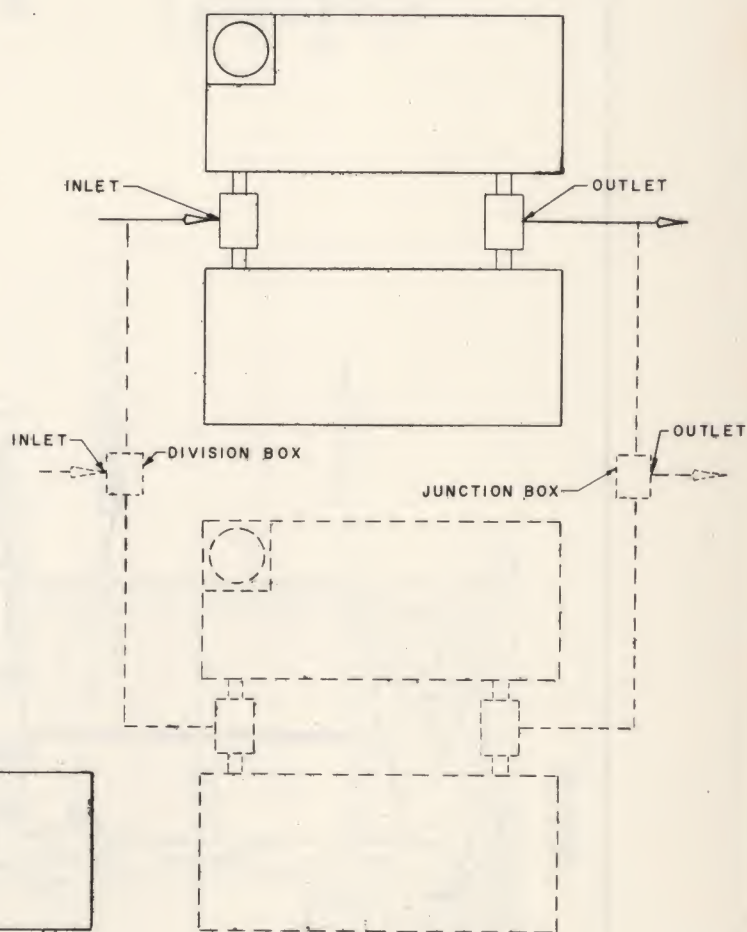
KANSAS CITY 15, MISSOURI

SCHEMATIC LAYOUT
 "OXIGEST"
 SEWAGE TREATMENT PLANT

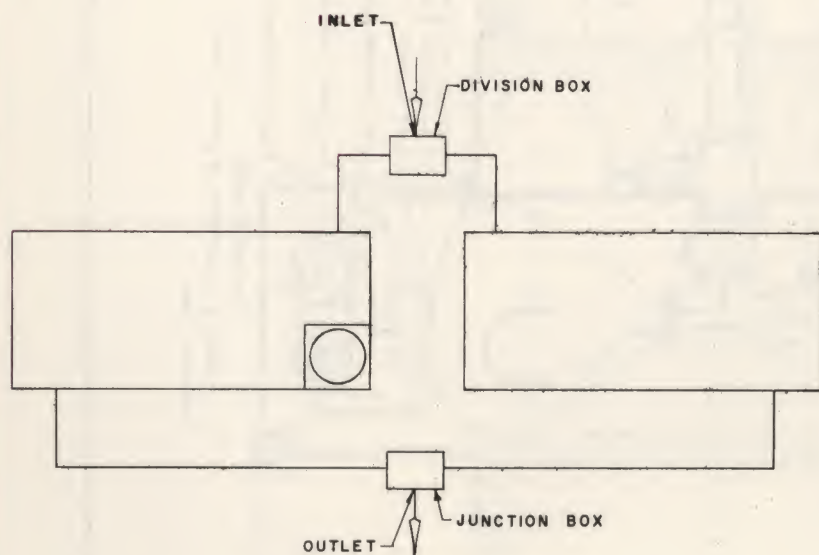
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SIMPLEX UNIT



MULTIPLE UNITS



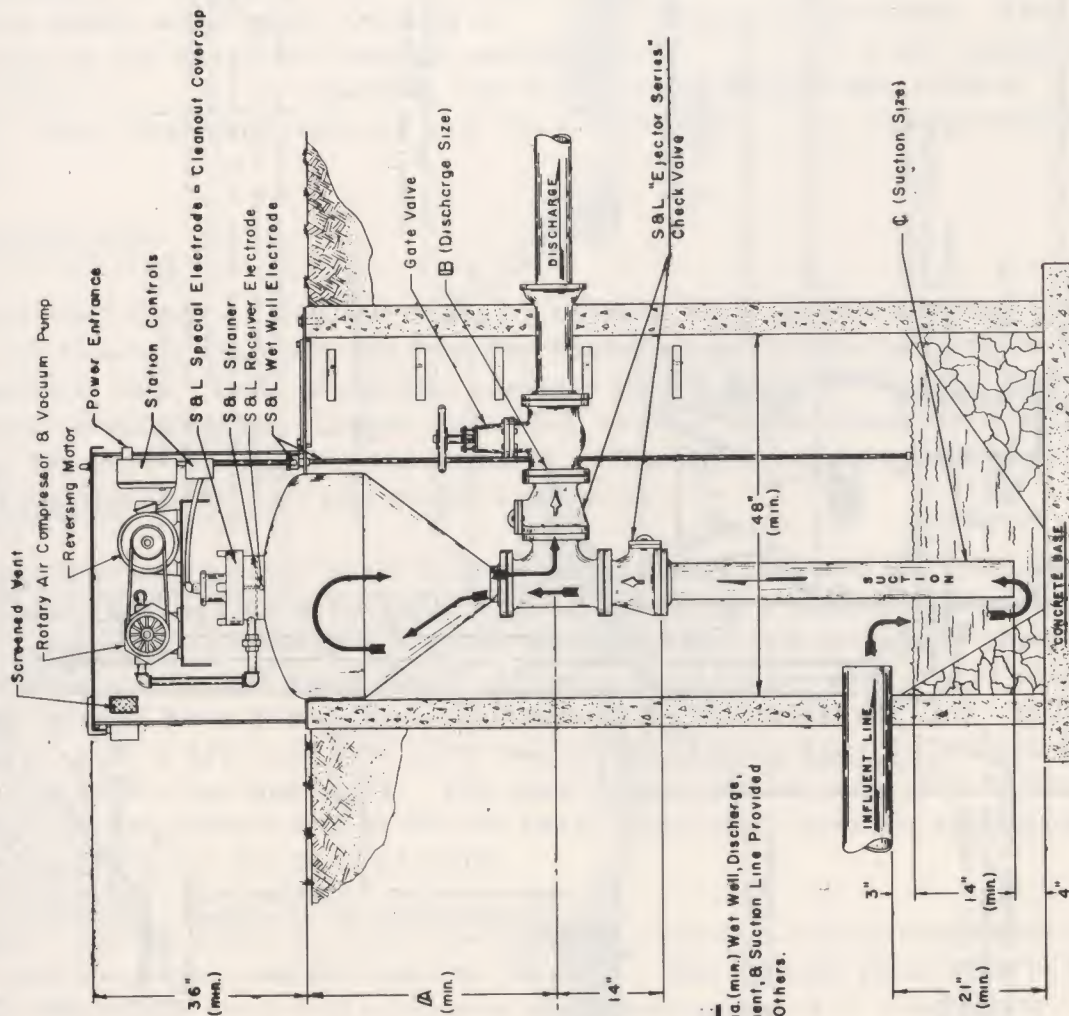
DUPLEX UNIT



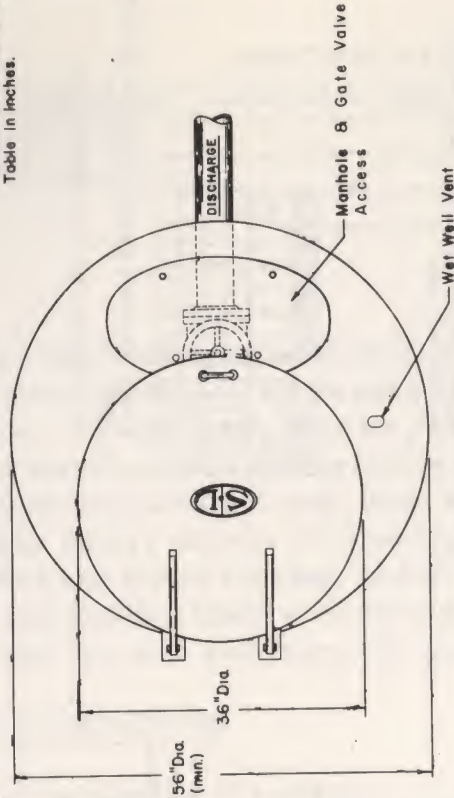
DIMENSION TABLE (Ref.)

G.P.M.	A	B	C
30	28	4	3
50	34	4	4
75	42	4	4
100	51	4	4

All Dimensions in Above Table in inches.



NOTE:
4'-0" Dia. (min.) Wet Well, Discharge, Influent, & Suction Line Provided By Others.



PLAN VIEW

SEQUENCE OF OPERATION

1. Liquid level in wet well rises to contact wet well electrode.
2. Wet well electrode relay energizes starting the motor and vacuum pump.
3. Vacuum pump removes air from receiver and outside air pressure causes the sewage to rise in the inlet pipe and receiver until the liquid level in the receiver reaches receiver electrode.
4. Receiver electrode energizes Discharge timing relay. Motor reverses and causes compressed air to enter the receiver, ejecting sewage.
5. After discharge is complete, unit returns to control by the wet well electrode.

S&L N.T.S.		S&L Sewer & Air Suction Lines S&L N.T.S.
S&L N.T.S. F.W. Barber		
S&L N.T.S. C.R. F&S		VAC-O-JECT STATION
S&L N.T.S. S&L		
S&L N.T.S. S&L		Typical Wet Well Installation
S&L N.T.S. S&L		
S&L N.T.S. S&L		DATE 12-4-56
S&L N.T.S. S&L		DWG. NO. 103

ELEVATION

VAC-O-LIFT SEQUENCE OF OPERATION

SIMPLEX INSTALLATION:

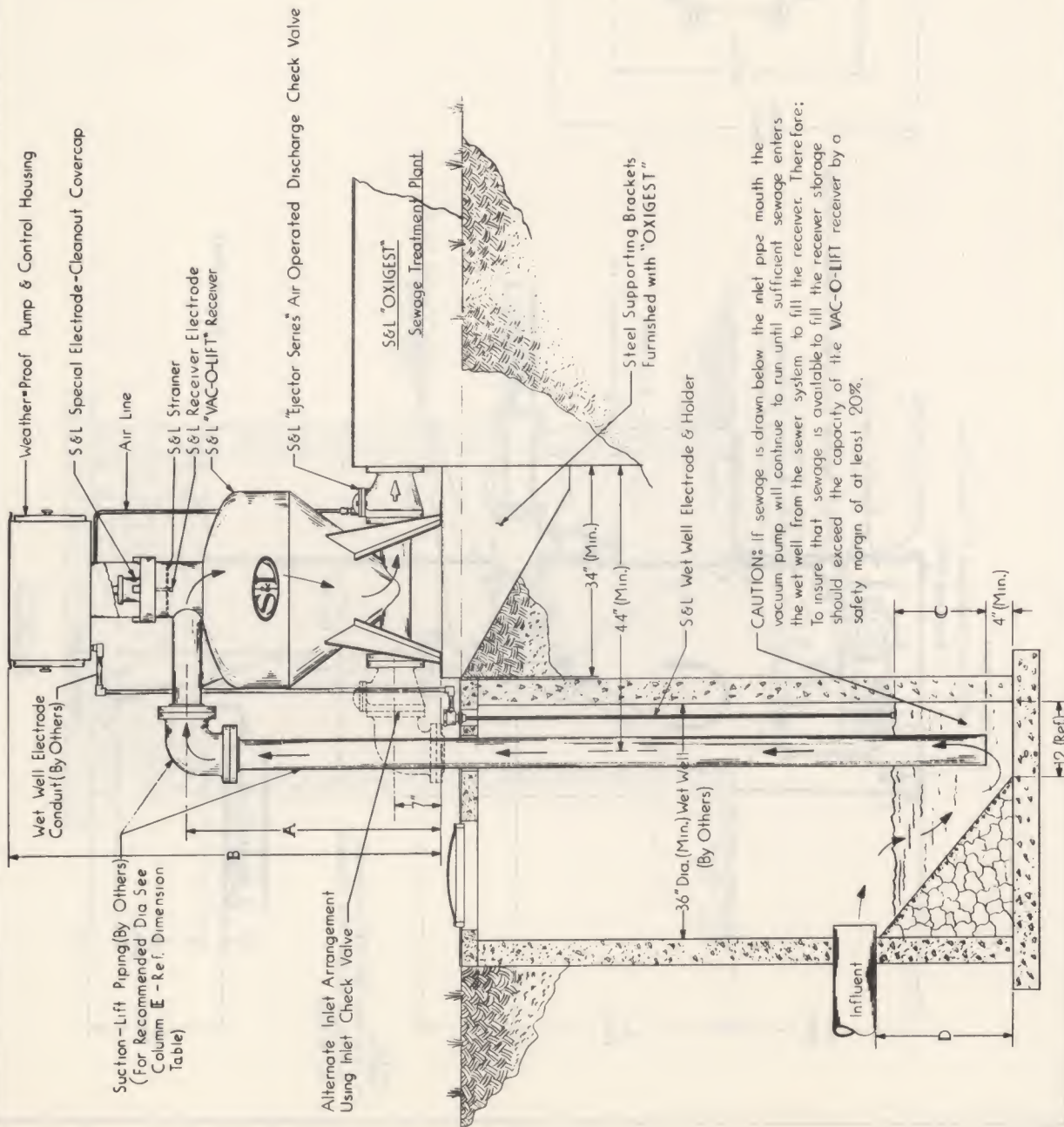
1. Liquid level in wet well rises to contact wet well electrode.
2. Wet well electrode relay energizes starting the motor and vacuum pump and closing vent line.
3. Vacuum pump removes air from receiver and outside air pressure causes the sewage to rise in the inlet pipe and receiver until the liquid level in the receiver reaches receiver electrode.
4. Receiver electrode timing relay opens the vent line and locks out motor and vacuum pump until VAC-O-LIFT discharge is complete. (Note: Time delay factory preset but is field adjustable.)
5. After discharge is complete unit returns to control by the wet well electrode.

DUPLEX INSTALLATION:

1. Operation of each unit is as described above. Electrode in wet well for second unit is set slightly higher than for first unit so that it will operate if first unit fails or does not have sufficient capacity.
2. Automatic alternation is provided to change sequence of operation on each cycle and to distribute the wear.

REFERENCE	UNIT	A	B	C	D	E
	GPM			*	*	
	30	33	59	16	23	3
	50	39	65	21	28	4
	75	47	73	28	35	4
	100	108	82	41	48	4

*These Suggested dimensions based on 36" dia wet well.
All dimensions are for reference only.



SCALE	IN		Smith & Lindless, Inc.
DRAWN BY	JGCS	P.O. BOX 4001	KANSAS CITY 18, MISSOURI
CHECKED BY	G.L.	Manufacturing Dept.	Laboratory, Research
		VAC-O-LIFT	
		Mild Climate Installation On	
		S&L OXIGEST	
REVISEMENTS		DATE	DESCRIPTION
DATE	DESCRIPTION	DATE	DESCRIPTION
		12-16-58	DRWG. NO. 3-D-2
		(S)	(S)

SPECIFICATIONS

Feb. 1, 1959

"OXIGEST" SEWAGE TREATMENT PLANT

Project _____

Location _____

Date _____

GENERAL

The contractor shall furnish and install one complete factory-built aeration type sewage treatment plant with all needed equipment factory installed in a welded steel structure. Similar units may be provided for parallel operation where the total capacity justifies such construction. The principal items of equipment in each unit shall include aeration tank, final settling tank, bar screen, air diffuser, effluent trough, rotary blower or blowers complete with necessary motors and controls, blower and motor housing, and all necessary internal piping and wiring. The aeration and settling basin structure shall be reinforced to withstand normal pressures from the soil and from the interior hydrostatic load.

OPERATING CONDITIONS

The plant shall be capable of treating _____ gallons per day of raw sanitary sewage or waste with organic loading of _____ pounds of 5-day BOD. This load is figured on the basis of a design population of _____, a per capita daily sewage flow of _____ gallons, and a per capita daily 5-day BOD of _____ pounds. This treatment capacity shall be provided in _____ sewage treatment unit(s).

CONSTRUCTION

Each unit shall form a complete sewage treatment plant by itself except that the blower (s) to serve multiple units may be installed in a single housing on top of one treatment unit. Units of smaller capacity shall be built as a single tank with two major compartments. Larger units shall be built by the Manufacturer in two sections for ease in shipment and handling. These sections shall be bolted and coupled together at the job site by the contractor.

The treatment tank proper shall contain the aeration tank and the final settling tank in one rectangular structure with all necessary baffles and partitions, factory assembled by welding. All side walls, bottom and partitions shall be of $\frac{1}{4}$ " thick structural grade steel plate. All structural shapes used for reinforcing and bracing shall have $\frac{1}{4}$ " minimum thickness in their thinnest section. Exterior vertical 3" x 4" x $\frac{3}{8}$ " tee bars on 6' maximum centers shall be welded to the sides to reinforce the tank walls. The tank bottom shall be extended to form an anchorage for the bottom end of the tee bars. Equivalent interior reinforcement shall be provided for the two end walls.

A weather-tight chamber to house the blowers, motors, regulating valves, air piping, and electrical controls shall be provided. The housing shall be a vertical cylinder with hinged cover and solid base plate constructed of $\frac{1}{4}$ " steel plate. The cylinder shall be large enough to accommodate the above equipment with reasonable clearance so that the plant operator will be able to service or adjust all

equipment. All blowers, motors, electrical controls and air piping shall be installed in the housing at the factory but the housing shall be shipped unmounted to the job site. Motors and blowers shall have resilient mountings and the chamber lid and sidewalls shall be insulated with noise suppressing material. A flexible section shall be inserted in the air discharge line for vibration dampening.

The cover for the machinery house shall be of the hinged type with suitable drip lip around the edge and with handle for opening. It shall have a lock of the pin tumbler type and shall have a dependable mechanism to latch it in the open position and keep it from blowing closed. The cover shall be spun from 12-gauge steel plate.

The base of the machinery house shall be a rectangular $\frac{1}{4}$ " thick steel plate with four mounting bolt holes drilled to match the holes in the main structure for field bolting by the contractor.

INLET BOX

A welded steel inlet box shall be provided in one side of the aeration tank to receive the incoming sewer. The sewer shall be ____ inch, Class 150 cast iron pipe furnished by the contractor to bridge the disturbed earth adjacent to the structure. The cast iron pipe will be grouted in place in the box during the installation by the contractor using Portland Cement Mortar containing Embecco.

Where two or more treatment units are operated in parallel, a division or distribution box shall be provided by the Manufacturer with necessary grout boxes attached to permit field pipe connection to the several inlets by the contractor.

INLET MANIFOLD AND BAR SCREEN

The inlet box shall direct the sewage into an inlet manifold or flume extending the full width of the aeration tank at the opposite end from the settling tank. The manifold shall have a hopper bottom with slot opening at the bottom extending the full width of the aeration tank to distribute the incoming sewage across the tank. A bar screen fabricated from $\frac{1}{4}$ " x 2" x 22" steel bars on 2" centers and extending 2'-8" along the manifold shall remove any unusually large solids from the raw sewage as it enters the plant. The bar screen shall be constructed to permit easy cleaning by raking from above. It shall have an overflow weir at the end to permit sewage to enter the plant should the screen become clogged. A baffle below the inlet slot shall deflect aeration tank liquor away from the inlet port.

AERATION TANK

The aeration tank shall be sized to provide at least 24 hours detention of the full design flow. It shall be provided with baffles where necessary to insure rapid circular flow without dead spots where sewage solids can accumulate and become septic.

Feb. 1, 1959

AIR DIFFUSER

An air distribution manifold shall be located near the bottom of the aeration tank directly beneath the inlet port. It shall be an open bottom rectangular box fabricated of aluminum, long enough to reach from one side of the tank to the other with minimum end clearances. The box shall be securely fastened between two long aluminum angles with pivot points at their far ends, all so arranged that the manifold may be swung up out of the aeration tank liquor for inspection and cleaning. A locking device operable from the surface shall be provided to hold the manifold securely in its operating position.

Sufficient orifices shall be provided in the top face of the manifold to insure uniform small bubble distribution of the air at the total rated capacity of the blowers over the entire width of the basin. Each orifice shall be lined with a Teflon plastic insert with 1/8" orifice opening.

Air shall be introduced from a pipe terminating beneath the open bottom manifold.

FINAL SETTLING TANK

The final settling basin shall be of the upflow type and shall have a hopper bottom formed by sloping inwardly the exterior side which is the end wall of the combined structure and by inclining the partition between the settling tank and the aeration tank. An inclined baffle in the end of the aeration tank shall be provided parallel to the dividing partition to provide a scum channel.

After rising through the final settling tank, the clarified liquid shall pass over the edges of the effluent weir trough which shall be connected to the outlet box by means of a flexible coupling of corrosion resistant material. The sludge which settles to the bottom of the tank shall pass continuously through the bottom slot and re-enter the aeration chamber.

The weir trough shall be made of 8-gauge stainless steel plate and have a V-shape bottom to permit easy removal by scraping of any algae or other growth forming on the under side. The weir edges shall be serrated. Separately mounted $\frac{1}{4}$ " steel scum baffles shall be installed on each side of the trough. The trough shall be capable of easy adjustment to level the weirs longitudinally and in relation to each other by means of four stainless steel bolts which support the trough.

OUTLET BOX

A welded steel outlet box shall be provided in the side of the final settling tank to receive the treated effluent from the weir trough. It shall accommodate a _____ inch diameter cast iron pipe furnished by the contractor to form the first section of outfall sewer and to bridge the disturbed ground adjacent to the structure. The cast iron pipe will be grouted in place during installation by the contractor using Portland Cement Mortar containing Embecco.

When two or more treatment units are operated in parallel, a junction box shall be provided by the Manufacturer with the necessary grout boxes attached to permit field pipe connections to the several outlets by the contractor.

TANK COVER

The combined aeration tank and final tank shall be covered with removable 18-gauge ribbed steel decking, capable of withstanding a uniform load of 50 pounds per square foot. Each panel shall be 18" maximum width so that it can be handled easily by one man. To prevent unauthorized access or contact with the sewage by children or vandals, the decking shall be held down by a fixed overhanging plate on one side of the tank and by a hinged locking bar extending the full length of the other side of the tank. The locking bar shall be designed for securing at each end by padlocks furnished by the owner.

BLOWERS

_____ blowers shall be furnished each to deliver _____ CFM of free air at _____ PSI when operating at a speed of _____ RPM. Blowers shall be rotary positive displacement type with V-belt connection to the motors. Blowers shall be Sutorbilt California Series, Size No. _____ or approved equivalent. Blowers shall be equipped with filter silencer on suction intake, and discharge piping shall include adjustable air relief valve.

A speed control device consisting of a pair of variable pitch sheaves adjustable by turning a single hand knob shall be furnished with one blower to permit variation of blower speed between the maximum and minimum speed limits allowable for the blower and motor furnished.

MOTORS

Each blower shall be driven by a _____ HP, 1750 RPM, _____ Phase, _____ Cycle, _____ Volt, horizontal electric motor with shielded drip proof enclosure and grease lubricated ball bearings. The motor not equipped with speed control device shall be mounted on a self adjusting base which automatically produces correct belt tension. The motors shall have a 15 % service factor but shall not be overloaded beyond the nameplate rating at the design conditions specified above.

Feb. 1, 1959

CONTROL

Each motor shall be controlled by a magnetic starter of the across-the-line type with overload and low voltage protection. A suitable circuit breaker of the thermal magnetic type shall be provided as a disconnecting device. Starter(s) and breaker(s) shall be in a common NEMA 1 enclosure with "Start" - "Stop" buttons in the cover. For three phase motors a heater coil shall be provided in each phase to give positive protection against single phasing.

WELDING

All steel structural members shall be joined by electric arc welding with fillets of adequate section for the joint involved. Where required for additional sectional strength, such welds shall be continuous inside and out.

PROTECTION AGAINST CORROSION AND ABRASION

After welding, the entire structure shall be blasted inside and out with steel grit to prepare the surface by removing rust, dirt, mill scale, weld slag, etc. On all surfaces two coats of "Versapox" epoxy resin coating, each 3 mils thick, shall be applied prior to shipment. A third coat shall be applied to the interior tank surfaces. The prime coat shall be yellow containing Zinc Chromate. The second and final coats shall be a dark green color. The Manufacturer shall provide sufficient "Versapox" epoxy coating for the contractor to touch up any damaged areas during installation in accordance with instructions provided.

To take the abrasion during loading, unloading and skidding into final position a sheet of steel shall be cemented to the tank bottom, using epoxy cement placed over the above coating.

For cathodic protection a minimum of two packaged magnesium anodes similar and equal to Apex No. 17 Anode-Paks shall be buried on opposite sides of the structure and securely connected thereto by heavy copper wires in good electrical contact with the steel.

PIPING

All air piping shall be Schedule 40 steel pipe with malleable iron fittings. All valves, 2 $\frac{1}{2}$ " or smaller, shall be bronze body valves.

WIRING

The treatment plant shall be completely wired at the factory except for the service entrance conductors. All wiring and electrical equipment shall be in accordance with the National Electrical Code. All wiring outside of the control panel shall be in rigid conduit or flexible moisture and oil proof conduit.

FACTORY TEST

The machinery house shall be completely assembled with the main structure at the factory to insure that it will fit. All pipe connections shall be made up and the compressor shall be operated and checked to be sure that all equipment is in working order, correctly aligned, and free from vibration prior to shipment. The machinery house shall be removed and prepared separately for shipment.

WORKMANSHIP & EXPERIENCE

All workmanship and materials throughout shall be of the highest quality. The treatment plant shall be the product of a manufacturer with a minimum of five years experience in the design and building of water and sewage treatment equipment.

MANUFACTURER

These specifications describe a factory-built treatment plant as manufactured by Smith & Loveless, Inc. because this product is deemed most suitable for the service anticipated. This is not done, however, to eliminate others equally as good and as efficient. The contractor shall prepare his bid on the basis of the particular equipment specified for the purposes of determining the low bid. The award of the contract will constitute a contractual obligation to furnish the specified equipment unless the contractor desires to follow the following procedure:

After the execution of the contract, substitution of equipment of makes other than those named in the contract will be considered for two reasons only:

- a. That the equipment proposed for substitution is superior in construction and/or efficiency to that named in the contract.
- b. That the equipment proposed for substitution is equal in construction and/or efficiency to that named in the contract.

In the event the contractor obtains the engineer's approval on equipment other than that for which the plant was originally laid out, the contractor shall at his own expense make any changes in the layout or piping necessary to accommodate the equipment.

It will be assumed that the cost to the contractor of the equipment proposed to be substituted is less than the equipment named in the contract and if the substitution is approved, the contract price shall be reduced by an amount equal to the savings.

GUARANTEE

The Manufacturer of the treatment plant shall guarantee for one year from date of shipment that the structure and all equipment shall be free from faults in design, materials and workmanship. The Manufacturer shall furnish replacement parts for any component proven defective, whether of his or other manufacture, during the guarantee period.

ADDITION TO "OXIGEST" SPECIFICATIONS
FOR MODEL 4A COMMINUTOR

COMMINUTOR

A sewage solids comminuting machine shall be provided at the inlet to the "Oxigest" Sewage Treatment Plant as shown on the plans. The machine shall be capable of cutting, shredding or grinding the sewage solids to a size which will pass through a $\frac{1}{4}$ " diameter opening. The machine shall operate automatically and shall comminute and discharge the solids to the "Oxigest" Plant without removing the solids from the sewage. The machine shall be driven by a 3/4 HP electric motor suitable for the available power supply and shall include all electrical wiring and controls necessary to permit automatic starting of the machine when the water level in the comminuting chamber reaches a predetermined height, and to permit automatic stopping of the machine after it has operated a predetermined period of time. The operating period shall be easily adjustable. The capacity of the machine shall be adequate for the sewage flow and solids load of the particular installation for which it is furnished. The machine shall be constructed of corrosion resistant material throughout. Cutting edges shall be designed for long life under the conditions of use. All parts subject to wear shall be easily removable and replaceable. It shall be similar and equal to the Model 4A Comminutor as offered by Smith & Loveless, Inc.

COMMINUTOR CHAMBER

The comminuting machine shall be mounted in a special steel chamber bolted to the main "Oxigest" Plant structure. The chamber shall be so constructed that the comminuting device can be removed for servicing if necessary without interrupting the operation of the sewage treatment plant. An automatic overflow bypass shall be provided so that in case of failure of the comminutor for any reason, the sewage will automatically overflow into the "Oxigest" Plant through the bar screen provided at the aeration tank inlet.

THE HISTORY OF THE UNITED STATES OF AMERICA

The history of the United States of America is a story of a young nation that grew from a small colony of settlers to a powerful world superpower. The story begins with the first European settlers in the early 17th century, who came to the New World in search of a better life. They found a land of vast natural resources and a people who were different from them. Over the years, the settlers and the native Americans fought a long and bitter war for the land. The war ended in 1783 with the signing of the Treaty of Paris, which gave the United States its independence. The new nation was born, and it began to grow and expand. It fought another war, the Civil War, in the 19th century, which was a struggle for the right of slavery. The war ended in 1865 with the signing of the Emancipation Proclamation, which freed the slaves. The United States then became a world power, and it fought two world wars in the 20th century. The first world war was fought between 1914 and 1918, and the second world war was fought between 1939 and 1945. The United States emerged from the second world war as the most powerful nation in the world, and it has remained so ever since.

The United States has a long and rich history, and it has many achievements to be proud of. It has been a land of freedom and opportunity, and it has been a land where people have come from all over the world to live and work. The United States has been a leader in many fields, including science, technology, and the arts. It has been a land of progress and innovation, and it has been a land where people have made great things happen. The United States has been a land of hope and dreams, and it has been a land where people have fought for a better life. The United States has been a land of many firsts, and it has been a land where many great things have been achieved. The United States has been a land of many heroes, and it has been a land where many great things have been done. The United States has been a land of many great things, and it has been a land where many great things have been achieved.

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THE UNITED STATES OF AMERICA

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ADDITION TO "OXIGEST" SPECIFICATIONS FOR A 7RS COMMUNUTOR

COMMUNUTOR

A sewage solids comminuting machine shall be provided at the inlet to the "Oxigest" Sewage Treatment Plant as shown on the plans. The machine shall be capable of cutting or shredding the sewage solids to a size which will pass through the $\frac{1}{4}$ " wide slot openings. The machine shall be suitable for average daytime rates of flow ranging from 21 GPM at 2" head differential up to 75 GPM at $4\frac{1}{2}$ " head differential. It shall be capable of handling maximum hourly flow of 133 GPM at 7" differential head. The machine shall operate automatically and shall comminute and discharge the solids to the "Oxigest" Sewage Treatment Plant without removing the solids from the sewage. The comminuting machine shall be of the rotating drum screen type. The drum shall rotate with its lower end submerged in the sewage and shall cut, shear and shred the sewage solids by means of teeth and cutting bars rotating with the drum and a stationary comb fixed on the main column casting of the comminutor.

The drum shall be of high grade cast iron and provided with $\frac{1}{4}$ " slots. The drum shall be mounted on a steel shaft and rotated by a $\frac{1}{4}$ HP electric motor through a high efficiency gear box. The motor shall be of the totally enclosed weather-proof type and shall operate on current of the same characteristics as the "Oxigest" blowers. The cutting members of the comminutor, the comb, cutting teeth and cutter bars, shall be specially hardened steel, and shall be easily removable for sharpening or replacement. The cutting teeth shall be of stainless steel with tungsten carbide tips. The three lowest slots in the rotating drum shall be shortened to provide better operating characteristics at low flow. The comminutor shall be a Model 7RS or equal as offered by Smith & Loveless, Inc.

COMMUNUTOR INSTALLATION

The comminuting machine shall be installed as shown on the plans. Where the comminutor is located inside the "Oxigest" Plant and above the inlet channel there shall be an integral overflow permitting the sewage to bypass the comminutor and discharge through the "Oxigest" bar screen to the "Oxigest" inlet channel in case of extraordinary flow, power failure, etc.

Where the comminutor is located outside of the "Oxigest" Sewage Treatment Plant, it shall be installed in a special steel chamber manufactured by Smith & Loveless, Inc., or in a concrete chamber of similar design constructed by others. The chamber shall be designed and constructed to provide an automatic overflow bypass around the comminuting machine if the comminuting machine fails for any reason to pass the sewage flow in the normal manner.

ADDITION TO "OXIGEST" SPECIFICATIONS
FOR A 7RS COMMUNOTOR

- 2 -

Complete electrical control equipment necessary for proper operation of the comminuting machine shall be furnished in a weather-proof cabinet and mounted in the "Oxigest" Sewage Treatment Plant blower housing. All wiring shall be completely installed in the factory if the comminuting machine is mounted on the "Oxigest" Sewage Treatment Plant. When the machine is mounted in a special chamber, wiring between the control cabinet and the comminuting machine shall be furnished by others. When the comminuting machine is immediately preceded by a lift station, special controls shall be provided to coordinate the operation of the comminutor and the lift station. When sewage flows by gravity to the "Oxigest" Plant, the comminutor shall run continuously, or it may be controlled by a time clock where all flow regularly ceases during a portion of the day or night.

SPARE PARTS

One complete set of cutting teeth and one extra comb shall be furnished with the comminuting machine. A complete set of cap screws, dowels and nuts to attach these parts shall be included.

TOOL KIT

There shall be furnished in a special tool box a complete set of all tools necessary to maintain the comminutor and, in particular, to replace the cutting teeth, comb, and cutter bars. The tool kit shall include special tooth puller, dowel extractor bar and grease gun. Three end wrenches and a set of five Allen wrenches shall be provided to fit all set screws and bolts in the machine.

ADDITION TO "OXIGEST" SPECIFICATIONS FOR
FOAM CONTROL WATER SPRAY SYSTEM

A water spray system shall be provided for control of foam or froth at the end of the "Oxigest" aeration tank. The spray system shall consist of properly spaced nozzles mounted on a water pipe header receiving water from a centrifugal pump mounted on a bracket in the "Oxigest" final settling tank and taking suction from the upper section of the final tank. The nozzles shall be brass and shall be similar or equal to Spraying System Company's $\frac{1}{4}$ K20 and shall be capable of producing a hard, flat spray of about 1.7 GPM at 7 p.s.i. water pressure with a spray angle of 130 degrees.

The pump shall be of the submersible type similar or equal to the Enpo Pump manufactured by Piqua Machine Works rated at 20 GPM at 19' TDH. The pump shall be driven by a 1/3 HP, 1750 RPM, _____ volt, _____ phase, 60 cycle motor with built-in thermal overload protection and a hand operated switch mounted in the "Oxigest" blower-motor housing. The pump shall be mounted in a chamber equipped with inlet corrosion resistant screens easily removable for cleaning. A float operated switch shall be provided to prevent pump operation when the inlet screens become clogged and inflow to the chamber stops. The complete water spray system shall be factory installed in the "Oxigest" and ready to operate on delivery of the "Oxigest" Sewage Treatment Plant to the job site.

THE HISTORY OF THE UNITED STATES OF AMERICA
IN TEN VOLUMES

The first volume of this series, which is now being published, contains the history of the United States from the discovery of the continent by Christopher Columbus in 1492 to the year 1789, when the Constitution was adopted. The second volume, which is now being published, contains the history of the United States from 1789 to the year 1800, when the Federalist party was defeated in the election of 1800. The third volume, which is now being published, contains the history of the United States from 1800 to the year 1812, when the War of 1812 broke out. The fourth volume, which is now being published, contains the history of the United States from 1812 to the year 1820, when the Missouri Compromise was passed. The fifth volume, which is now being published, contains the history of the United States from 1820 to the year 1830, when the Texas Revolution broke out. The sixth volume, which is now being published, contains the history of the United States from 1830 to the year 1840, when the Mexican War broke out. The seventh volume, which is now being published, contains the history of the United States from 1840 to the year 1850, when the California Gold Rush began. The eighth volume, which is now being published, contains the history of the United States from 1850 to the year 1860, when the Civil War broke out. The ninth volume, which is now being published, contains the history of the United States from 1860 to the year 1870, when the Reconstruction era began. The tenth volume, which is now being published, contains the history of the United States from 1870 to the year 1880, when the Gilded Age began.

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ADDITION TO "OXIGEST" SPECIFICATIONS
FOR SLUDGE STORAGE

SLUDGE STORAGE

A sludge storage tank shall be provided, either as an integral rectangular addition to the main tank structure or as a separate cylindrical tank as shown on the plans. It shall be large enough to hold _____ cu. ft. of sludge and shall be constructed of $\frac{1}{4}$ " thick structural grade plate reinforced where needed as specified for the aeration and final tanks. It shall have a cover of $\frac{1}{4}$ " steel plate with access manhole and vent pipe with flame check installed. Inlet and overflow piping shall be installed complete in the integral rectangular sludge tank addition, but external connecting inlet and overflow piping required between the main "Oxigest" Treatment Plant and separate cylindrical sludge storage tanks shall be furnished and installed by others.

AIR LIFT

An air lift shall be provided for transferring sludge from the aeration tank to the sludge storage tank. It shall be powered by air from the "Oxigest" blower installation and controlled by manual valve operation. Air lift shall be furnished complete with air piping supports, and internal discharge piping as noted above. The riser pipe shall be 3" in diameter and the capacity of the air lift shall be not less than 40 GPM at 85 percent submergence using air at the rate of 5 CFM.

1907

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4

ADDITION TO "OXIGEST" SPECIFICATIONS FOR
HYPOCHLORINATOR HOUSING

CHLORINATOR HOUSING

There shall be provided one chlorinator housing consisting of a 36" diameter vertical steel cylinder, 3' high with bottom plate and hinged lid equipped with a lock. The housing shall be constructed of $\frac{1}{4}$ " steel plate and protected against corrosion as described on Page 5 of the "Oxigest" Sewage Treatment Plant specifications. A bracket mounting for the hypochlorinator and an opening for the hypochlorinator discharge line shall be provided. The interior shall be lined with 1" fiber glass insulation. For installations in locations subject to sub-freezing temperatures, one unit space heater of adequate capacity to maintain temperature above freezing shall be provided. The unit heater shall be complete with integral thermostatic control and blower.

ADDITION TO "OXIGEST" SPECIFICATIONS FOR
CHLORINE EQUIPMENT

HYPOCHLORINATOR

To provide for chlorination of the "Oxigest" Sewage Treatment Plant effluent as specified, a heavy duty _____ solution feed pump of the positive displacement type designed for feeding sodium or calcium hypochlorite or similar solutions shall be supplied. The unit shall be acid and alkali resistant and all parts which come in contact with the pumped solution shall be chemically resistant plastic or synthetic rubber. The machine shall be capable of injecting solutions against pressures up to _____ p. s. i. and the pumping rate shall be easily adjustable between _____ and _____ gallons per hour. The hypochlorination unit shall be complete with _____ HP, _____ volt, _____ cycle, _____ phase electric motor, plastic fittings, plastic tubing, foot valve, injection check valve, _____ gallon crock(s), instruction book, spare parts and special tools. The hypochlorinator shall be similar and equal to Model _____.

CHLORINE CONTACT TANK

The chlorine contact tank shall have a capacity of _____ gallons and shall be constructed of $\frac{1}{4}$ " steel plate and protected from corrosion exactly as the "Oxigest" Sewage Treatment Plant. The tank(s) shall be _____ with center baffle and inlet and outlet couplings as required by the engineer or shown on the plans. The center baffle shall extend to a depth of 12" above the bottom of the tank. A drain pipe and valve shall be installed where the installation conditions permit the tank to be drained. The tank shall be installed in the location shown on the plans.

ADDITION TO "OXIGEST" SPECIFICATIONS
FOR AIR LIFT INSTALLATION

_____ air lift(s) shall be installed in the "Oxigest" Sewage Treatment Plant as shown on the plans. The air lift shall be firmly supported on a special base plate and shall be installed to permit easy removal for maintenance. The riser pipe shall be 3" in diameter and the horizontal discharge pipe shall be a 2" line supported on the side of the "Oxigest" Plant.

The air supply for the air lift(s) shall be obtained from the "Oxigest" Plant blower(s) through a 1" air line with globe or plug valves provided to regulate air supply to each air lift. Each air lift shall have a capacity of not less than 40 GPM at 85 percent submergence using air at the rate of 6 c.f.m.

ADDITION TO "OXIGEST" SPECIFICATIONS
FOR WEIR BOX

A 90 degree V-notch weir for measuring sewage flow shall be provided in a rectangular steel chamber specially designed for this purpose. The weir box shall be complete with weir plate, baffle plate and facilities for inlet and outlet pipe connections. It shall be installed as shown on the plans at or near the outlet of the "Oxigest" Sewage Plant.

The weir plate shall be of $\frac{1}{4}$ " aluminum and shall be held in the weir box in stop gate grooves. The 90 degree V-notch shall be 5" deep to provide a maximum flow capacity of approximately 130 GPM. The notch shall be cut with extreme accuracy and care to maintain sharp upstream edges and exact cross section, and the downstream edge shall be beveled. The bottom of the notch shall be approximately 5" above the floor of the chamber and the invert of the outlet sewer. The invert of the inlet sewer shall be at the same elevation as the bottom of the weir notch.

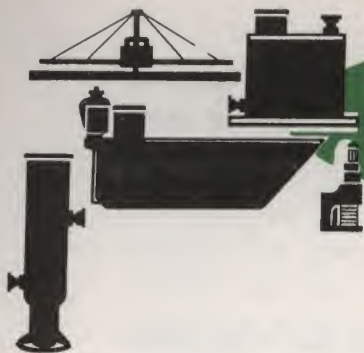
The weir box shall have a protective coating of epoxy resin exactly as provided on the "Oxigest" Plant.

STATEMENT OF THE BOARD OF DIRECTORS
FOR THE YEAR 1900

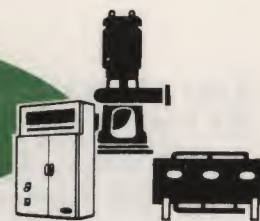
The Board of Directors of the National Bank of Commerce, New York, has the honor to acknowledge the receipt of the statement of the Board of Directors of the National Bank of Commerce, New York, for the year 1900, and to state that the same has been read and approved by the Board of Directors of the National Bank of Commerce, New York, and that the same is hereby published for the information of the stockholders of the National Bank of Commerce, New York.

The Board of Directors of the National Bank of Commerce, New York, has the honor to acknowledge the receipt of the statement of the Board of Directors of the National Bank of Commerce, New York, for the year 1900, and to state that the same has been read and approved by the Board of Directors of the National Bank of Commerce, New York, and that the same is hereby published for the information of the stockholders of the National Bank of Commerce, New York.

The Board of Directors of the National Bank of Commerce, New York, has the honor to acknowledge the receipt of the statement of the Board of Directors of the National Bank of Commerce, New York, for the year 1900, and to state that the same has been read and approved by the Board of Directors of the National Bank of Commerce, New York, and that the same is hereby published for the information of the stockholders of the National Bank of Commerce, New York.



Smith & Loveless. **Engineering DATA**



P. O. BOX 8884

KANSAS CITY 15, MISSOURI

INSTALLATION INSTRUCTIONS

FOR

"OXIGEST"

FACTORY-BUILT SEWAGE TREATMENT PLANT

Your Smith & Loveless "Oxigest" Plant is a complete factory-built treatment plant with all equipment ready to operate. It has been assembled at the factory to insure that the parts will fit together. The mechanical and electrical equipment have been tested by actual operation of the blower (s) and have been found free of defects.

Because of roadway clearance restrictions the housing which contains the blower (s) and related electrical equipment has been removed and placed on the gooseneck of the trailer for shipment. Such special accessories as comminutor chambers, chlorine contact tank and weir box, which sometimes may be bolted to the main "Oxigest" structure, also are shipped unmounted.

It is a simple matter to reassemble the few parts which were dismantled for shipment and to install an "Oxigest" Plant. To insure that nothing is omitted, we recommend that you read the following detailed instructions carefully. Also, re-check the plans and specifications as prepared by the engineer.

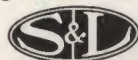
ELECTRICAL POWER

Experience has demonstrated that lack of electrical power is the major cause of delay in placing "Oxigest" Plants in operation. Your Smith & Loveless "Oxigest" Unit has been so designed that the maximum size entrance service cable required will be No. 6 A. W. G. stranded with type RW or TW insulation. (Note: No. 6 cable is adequate for two, 5 HP motors on single phase, 60 cycle, 230 volt or two, 7½ HP motors on 3 phase, 60 cycle, 240 volt). In accordance with the National Electrical Code No. 6 is also the minimum allowable for service entrance. The conduit entrance provided with your "Oxigest" Unit will be for 1½" rigid conduit. The electrical components in the "Oxigest" will be provided in accordance with the electrical service available as specified in your order.

Contact your electrician and the local power company without delay and tell them that you will need a ____ Volt, ____ Phase, ____ Cycle power supply for ____ HP air blower motors. If you want lights for night operations the electrician must provide these, together with a fusible disconnect switch or circuit breaker for such single phase service, unless 4-wire, 3 phase or 3-wire, single phase is used for blower motors. No fusible disconnect switch or circuit breaker is required for the main power service because suitable circuit breaker (s) are provided inside the housing.

IIO-2

Feb. 10, 1959



MANUFACTURERS • LIFT STATIONS • WATER AND SEWAGE TREATMENT EQUIPMENT

Your electrician must provide rigid conduit from the meter on the power pole to the connection on the blower housing, and must furnish suitable wire, as described above, to bring the power to the input terminals of the circuit breaker (s) inside the blower housing.

EXCAVATION

In normal soil a bulldozer can scrape out the hole to receive the "Oxigest" Plant in a short time. We recommend that the excavation be made just before installation so that the bottom will not be softened unnecessarily by rainfall, drainage or seepage. One end should be sloped carefully to form a ramp or inclined plane down which the bulldozer can drag the unit to its final position, if a crane will not be available to handle the unit.

The bottom should be excavated accurately to finished grade. Grade stakes should be set with a level to insure that the bottom will be level and true. This will provide uniform bearing over the entire tank bottom. Use of several inches sand or fine gravel in the bottom of the excavation may be desirable.

It is important that all elevations be checked carefully and that the foundation be level to insure proper flow of the sewage into and out of the plant.

Under adverse soil conditions the engineer may find it necessary to specify a reinforced concrete pad beneath the treatment plant. Screeds for the concrete should be placed with a level to insure that the top surface is flat and level.

FLOTATION

If the "Oxigest" Plant is installed underground in extremely fluid soil, or if the ground water table is almost up to the top of the "Oxigest" Plant, it may be necessary to anchor the structure with concrete to prevent flotation when the tanks are dewatered. Under such conditions the plant is usually placed on a concrete pad to secure a good foundation. The pad can be sized to provide the necessary weight to prevent flotation and the structure can be anchored to the concrete pad with anchor bolts and clip bars projecting over the edge of the bottom face of the structure. For permanent installation we recommend pouring additional concrete around the edge to protect the anchor bolts and clip bars and to provide additional weight.

If such conditions are encountered unexpectedly, check with the engineer before proceeding.

UNLOADING AND PLACING THE TANK

The "Oxigest" Plant will normally be delivered to the job site on our lowboy truck. The unit can best be placed by lifting into position with a crane but it can be winched or skidded into place without great difficulty using a bulldozer. The contractor should clear and level an area in front of the proposed ramp leading into the excavation. Preferably this should be at the end of the excavation

corresponding to the outlet end of the plant. All sharp or large stones must be removed from the area and from the surface of the ramp over which the plant is to be dragged. We recommend that timber skids be provided by the contractor on which the plant can be unloaded. Also, additional timber skids should be placed down the ramp. The truck driver will assist in unloading the plant but the contractor must provide a bulldozer or winch and crew. Lifting and tow connections are built into the structure.

The bulldozer or winch may be used to slide the plant off the side of the low boy onto a low dirt ramp easily provided alongside the truck. When the excavation is ready, the bulldozer or winch pulls the plant down the ramp over the timber skids. The contractor should provide a long enough cable so that the bulldozer does not rest on the finished foundation when the "Oxigest" has reached the bottom of the ramp. The foundation should then be leveled to remove any damage done by the bulldozer. The bulldozer then pulls the structure to its final position.

After setting the plant in position check carefully to be sure it is level and that the inlet and outlet are in the proper position and at the proper elevation.

ASSEMBLY

Every "Oxigest" Plant has a drain hole at the bottom to let out rainfall during storage or while in transit. Screw in the plug provided to close this opening and coat it with "Versapox".

Use a light crane or hoist to lift the blower housing into position, or skid it into position after backfilling. Bolt it in place and couple the air pipe connections with the materials provided. Attach the special chamber and accessories.

Bring the incoming sewer to the plant over the compacted backfill and seal the end into the inlet box with Portland Cement Grout or connect it to the special fitting provided. Install and connect the outlet pipe in the same way. Cast iron pipe should be used for both inlet and outlet pipes over the disturbed ground. "Embecco" should be used in the grout to insure a tight joint. A mixture of one part "Embecco", two parts Portland Cement, and three parts sand is a satisfactory mixture. The incoming sewer should slope down to the plant and the outgoing sewer should slope away from the plant.

Complete the electrical hook-up and check the motor rotation. Direction arrows are provided on the blower housing to indicate the correct rotation. Check the motor alignment and belt tension to be sure they are satisfactory.

CAUTION:

DO NOT OPERATE MOTORS, BLOWERS OR OTHER MECHANICAL EQUIPMENT BEFORE READING OPERATING INSTRUCTIONS AND FOLLOWING LUBRICATION DIRECTIONS.

CORROSION PROTECTION

The plant is fabricated of $\frac{1}{4}$ " thick structural grade steel plate. It is coated with "Versapox" epoxy resin coating after shot blasting to remove dirt, mill scale, etc. In addition another layer of steel sheet is cemented to the bottom using epoxy cement. This outer layer of steel takes the abrasion during unloading and skidding into final position. Thus, the "Versapox" coating remains intact. The contractor must remove the steel decking generally furnished as a cover for the tank, inspect the structure inside and out and touch up any damaged areas on the side walls, cover, etc. Sufficient "Versapox" epoxy coating is provided for the purpose. Replace the steel cover as soon as the "Versapox" is dry on any seating surface, in order to keep out dirt and debris.

Magnesium anode paks are shipped inside the blower housing. These have long insulated leads connected to the magnesium blocks inside the paks. Cut the insulation off the first 1" of each lead. Clamp the wire from one pak in each solderless connector and coat the solderless connectors with "Versapox". The solderless connectors are on the vertical stiffener tee bars on the outside of the structure. The anode paks should be buried in the backfill as far out from the structure as possible.

BACKFILLING

After the "Versapox" used for touch up is solid, backfill the installation, using great care to avoid damaging the magnesium anode paks and wiring, or the external coating on the structure. Backfill material must be free from rocks, trash, and unusual chemical materials which might create a strongly acid or caustic environment around the tank. Clean loam or clay is preferred. The fill must be carefully compacted, especially beneath the inlet and discharge pipes. Unless the structure has our "Special Reinforcing", however, care must be used to avoid deflecting the tank walls inward by high soil pressure. Where water is readily available we recommend filling the tank as the backfill is placed so that the water pressure will provide internal support for the walls. Keep the water level a foot or two above the fill, where this is possible.

The use of sand or gravel to backfill is not recommended for a standard plant which is placed with most of its depth below ground level. "Special Reinforcing" is required to withstand the soil pressures which would result from such fluid materials when the tank is empty.

GRADING

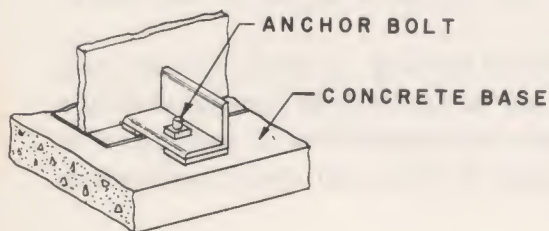
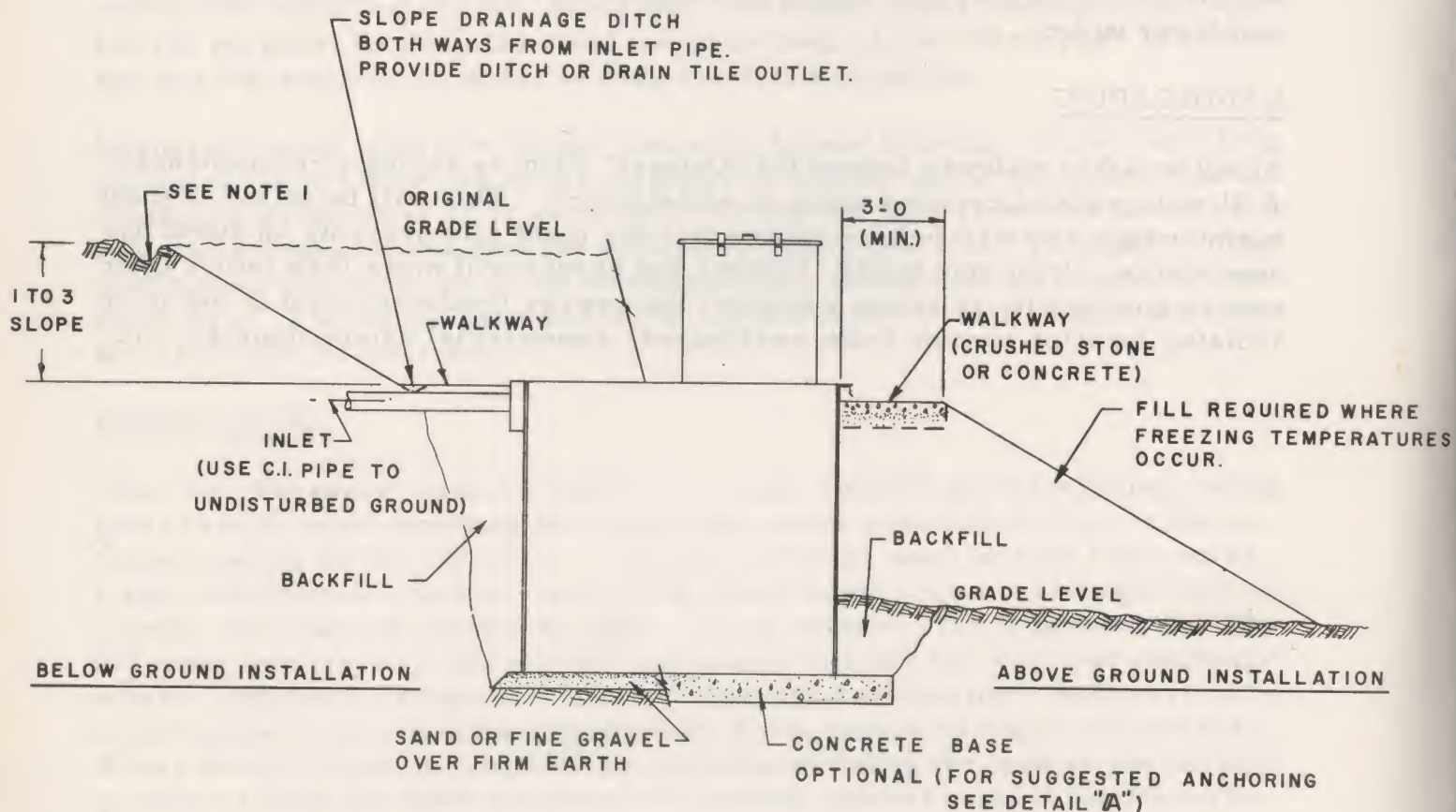
The finished grade around the "Oxigest" Sewage Treatment Plant should be at least 2" below the top of the tank and the ground should slope away from the plant to insure that surface water will not drain into the tank. Where the top of the "Oxigest" is below the surrounding ground level, surface drainage should be diverted from the depression in which the "Oxigest" is placed by means of dikes and/or ditches. A small drainage ditch at the foot of the depression cut should be provided to carry rain water falling in the depression to an outlet drain pipe or ditch or to a yard drain inlet on the "Oxigest" outlet sewer.

If the "Oxigest" Plant is placed so that the top of the tank is more than 1' above the surrounding ground, it is recommended that an embankment having a 3' wide berm at the top be placed around the "Oxigest" Plant. The top of the berm should be no more than 1' below the top of the tank in locations where freezing temperatures are experienced regularly in winter months. The berm provides insulation for the "Oxigest" Plant as well as providing a convenient walkway for operation and maintenance purposes. In the far southern areas of the United States where freezing temperatures seldom occur, the embankment may be omitted but the tank then should be equipped with access steps or ladder and a walkway on top.

LANDSCAPING

An all-weather walkway around the "Oxigest" Plant is strongly recommended. A 3' wide walk of crushed stone is satisfactory. This will be an aid in plant maintenance and will help to insure that the plant site presents an attractive appearance. Well kept grass, flowers and shrubs will more than return their cost in good public relations whenever the sewage treatment plant is not in an isolated location remote from residences, commercial establishments, etc.

"OXIGEST" Installation Details

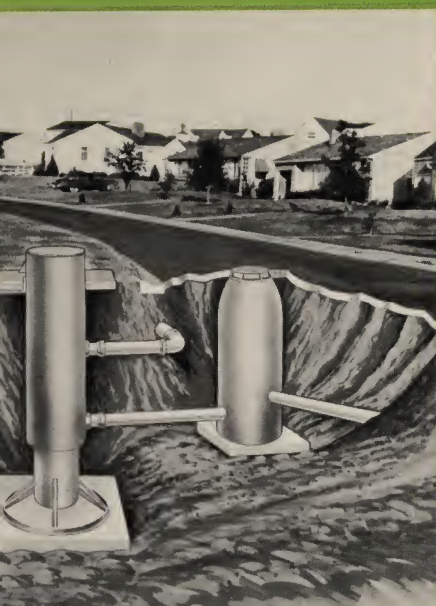


DETAIL "A"

NOTE:

1. EXTEND DITCH AS FAR AS NECESSARY TO DIVERT ALL SURFACE WATER FROM PLANT INSTALLATION.
2. IF SITE TOPOGRAPHY DOES NOT PERMIT CONVENIENT DISCHARGE OF SURFACE DRAINAGE FROM PLANT AREA, A YARD DRAIN CONNECTED TO "OXIGEST" OUTLET SEWER MAY BE USED.
3. FOR FURTHER INFORMATION SEE INSTALLATION INSTRUCTIONS PAGES 4 AND 5.

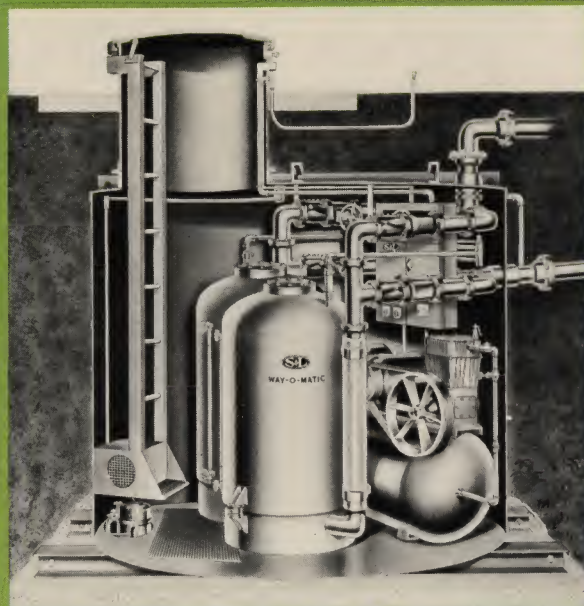




Smith & Loveless "MON-O-JECT" "DU-O-JECT"

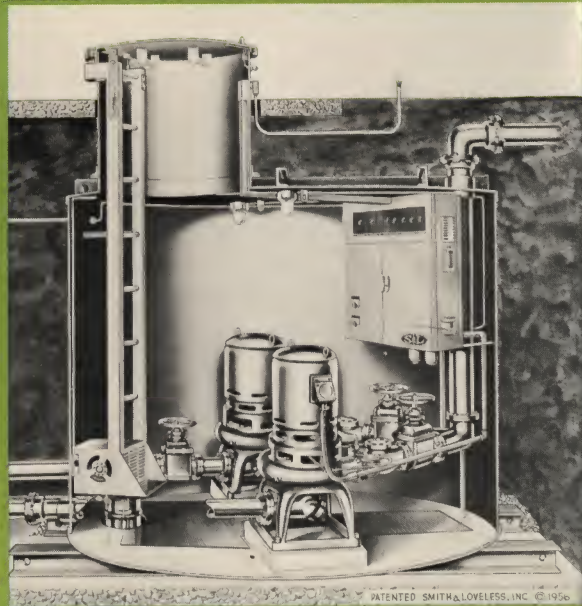
PNEUMATIC EJECTOR STATIONS

For factories, schools, motels and small subdivisions. Capacities 30 GPM to 200 GPM.



Smith & Loveless "WAY-O-MATIC" DUPLEX PNEUMATIC EJECTOR STATION

Utilizes the Smith & Loveless "Way-O-Matic" principle to lift sewage flows too small for pumping without excessive clogging. Standard 8' station lift 100 GPM maximum. Special 9'-6" stations have been built for 200 GPM or more.



Smith & Loveless DUPLEX PUMP STATION

For larger capacities, pump-type stations are more compact, and hence cost less than ejector-type stations. For such capacities, pumps are more efficient, permitting reduced connected horsepower as well as power savings. Available from 100 GPM to 4500 GPM per pump.

WRITE FOR SMITH & LOVELESS ENGINEERING DATA MANUAL, DESCRIBING S & L PUMP STATIONS & PNEUMATIC SEWAGE EJECTORS

REPRESENTATIVE SMITH & LOVELESS SEWAGE LIFT STATION AND "OXIGEST" INSTALLATIONS

Springfield, Ohio
Bessemer, Alabama
Lake Jackson, Texas
USAF, LaVerne, Calif.
Natchitoches, Louisiana
Coral Gables, Florida
Danville, Illinois
Plymouth, Michigan
Lufkin, Texas
White Bear Lake, Minnesota
Lenexa, Kansas
Davenport, Iowa
McMechen, West Virginia
Hartford, Connecticut
Strathroy, Ont., Canada
Roscommon, Michigan
West Palm Beach, Florida
USAF, Little Rock, Ark.
Wichita, Kansas
Gary, Indiana
Brighton, Colorado
Park Forest, Illinois
Fort Crowder, Missouri
Akron, Ohio
Midvale, Utah
Jackson, Mississippi
Duluth, Minnesota AFB
Orlando, Florida
Flint, Michigan
Decatur, Illinois
West Chester, Pennsylvania
Lexington, Kentucky

Dallas, Texas
Milton, Massachusetts
Midland, Michigan
Grand Forks, North Dakota
Millington, New Jersey
Belleville, Illinois
Storm Lake, Iowa
Daytona Beach, Florida
Fairbanks, Alaska
Mena, Arkansas
Detroit, Michigan
Cheyenne, Wyoming
"NIKE"—Millersport, New York
Castlewood, South Dakota
Las Cruces, New Mexico
Alden Park, New Jersey
Minot, North Dakota
Kansas City, Missouri
Burnaby, B. C., Canada
Lake Park, Florida
Ames, Iowa
Fremont, Nebraska
Shreveport, Louisiana
El Paso, Texas
Kearny, New Jersey
St. Louis, Missouri
Casper, Wyoming
Pompano Beach, Florida
Baton Rouge, Louisiana
Orange County, California
Ypsilanti, Michigan
Peoria, Illinois

Waynesboro, Ohio
Clarksville, Virginia
Spring Hope, North Carolina
Lakeland, Florida
Elm Grove, Wisconsin
New Haven, Connecticut
Lansing, Michigan
Winthrop, Maine
Winter Park, Florida
Clifton, New Jersey
Poplarville, Mississippi
Osborne, Pennsylvania
Boulder, Colorado
Benton Twp., Michigan
North Brunswick, New Jersey
Muskogee, Oklahoma
San Antonio, Texas
Miami, Florida
Lincolnton, North Carolina
Lansing, Illinois
Bluff City, Tennessee
Arnprior, Ont., Canada
Glendale, West Virginia
Vicksburg, Mississippi
Alpena, Michigan
Mountain View, California
Indianapolis, Indiana
Kansas City, Kansas
Vicksburg, Mississippi
Sheffield, Alabama
Hopkins, Minnesota
Alexandria, Louisiana
Chicago, Illinois

Ossining, New York
Shell Lake, Wisconsin
Nicholasville, Kentucky
Madison, Indiana
Springfield, South Dakota
Jacksonville, Florida
Sewickley, Pennsylvania
Fort Lauderdale, Florida
Springfield, Massachusetts
Fort Leonard Wood, Missouri
Vineland, New Jersey
Trumbull County, Ohio
Lancaster, New York
Chicago Heights, Illinois
Vidalia, Georgia
Mobile, Alabama
Manhattan, Kansas
Laurel, Mississippi
Bloomington, Indiana
Dumont, New Jersey
Fontana, California
St. Paul, Minnesota
Raleigh, North Carolina
Rockford, Illinois
USAF, Topeka, Kansas
Salt Lake City, Utah
Two Rivers, Wisconsin
Maple Shade, New Jersey
Council Bluffs, Iowa
Toledo, Illinois
Omaha, Nebraska
Cleveland, Ohio
Granite City, Illinois

Delano, Minnesota
Salina, Kansas
Smyrna, Tennessee
Indianola, Mississippi
Aiken, South Carolina
Champaign, Illinois
Dayton, Ohio
Fort Myers, Florida
Lawrence, Kansas
Joliet, Illinois
Columbia, Missouri
Gloucester City, New Jersey
Columbus, Nebraska
Fort Wayne, Indiana
Arkansas City, Kansas
Wadena, Minnesota
Collingswood, New Jersey
Coffeyville, Kansas
East St. Louis, Illinois
Maumee, Ohio
Grand Isle, Louisiana
Belleville, Illinois
Wycoff, Minnesota
Aneth, Utah
Baton Rouge, Louisiana
Hallandale, Florida
Akron, Ohio
West Lafayette, Indiana
East Peoria, Illinois
St. Clair County, Illinois
Kansas City, Missouri
Cincinnati Defense Area (8)



SMITH & LOVELESS, INC. P. O. BOX 8884
KANSAS CITY 15, MISSOURI

PLANT: LENEXA, KANSAS

REPRESENTATIVES IN PRINCIPAL CITIES